




SOUTH SASKATCHEWAN RIVER DEVELOPMENT PROJECT

**SOUTH SASKATCHEWAN RIVER
DEVELOPMENT COMMISSION**



1958-1963

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South Saskatchewan River Development Project

1958 to 1963

Past Progress and Future Prospects

South Saskatchewan River Development Commission

Legislative Building

Regina, Saskatchewan

SOUTH SASKATCHEWAN RIVER DEVELOPMENT COMMISSION

MINISTER

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G. C. POWER
Program Planning Officer

Regina, Saskatchewan.
March 1, 1964.

Hon. W. S. Lloyd,
Minister,
South Saskatchewan River Development Commission,
Regina, Saskatchewan.

Sir:

It gives me great pleasure to present the fourth progress report of the South Saskatchewan River Development Commission, covering planning and development of the multi-purpose South Saskatchewan River Development Project.

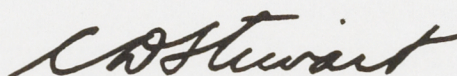
The past year has been a crucial one in the construction of the reservoir as preparations were pressed forward for diversion of the river early in 1964. A number of major plans for development of the various benefits by several provincial government agencies have also been greatly advanced.

The excellent progress achieved thus far has been due in large part to the spirit of co-operation with which federal and provincial government agencies have approached their respective tasks. An extended treatment of the contribution of these agencies is not possible within the limits of this report, but the Commission would like to acknowledge their important contribution.

There is a growing awareness of the importance of developing our water resources for Saskatchewan people. The strategic position of the South Saskatchewan Reservoir with respect to the expanding demands for water in the southern part of the province has prompted the Commission to produce a non-technical report. In this way it is hoped that a better understanding of the place and importance of the project will be promoted.

In conclusion, I would like to express my appreciation to the members of the Commission and to the Commission staff for their efforts and assistance during the year.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read 'C. D. Stewart', written in a cursive style.

C. D. STEWART,
Chairman.

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THE SOUTH SASKATCHEWAN RIVER DEVELOPMENT COMMISSION

Chapter I

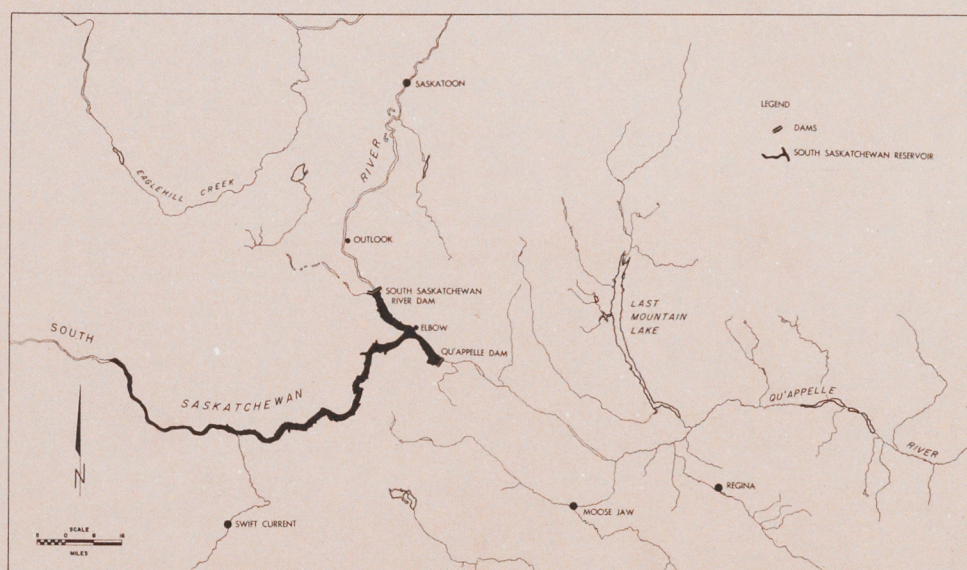
THE PROJECT

On July 25, 1958, the Governments of Canada and Saskatchewan signed an agreement authorizing construction of the multi-purpose South Saskatchewan River Development Project. The project involves the creation of a huge reservoir on the South Saskatchewan River in the general vicinity of the Elbow. Two dams are required to form the reservoir, a main dam located on the river 18 miles upstream from Outlook and a secondary dam to block the Qu'Appelle Valley southeast of the Elbow.

Under the 1958 Agreement the design and construction of the reservoir, including the two earth dams, is the responsibility of the federal government, with the construction costs shared 75% by Canada and 25% by Saskatchewan. The development and financing of the benefits, including irrigation, power and recreation are the sole responsibility of the Province of Saskatchewan. The Saskatchewan Department of Agriculture is responsible for irrigation, the Saskatchewan Power Corporation for the hydro power scheme and the Department of Natural Resources for recreation facilities.

The South Saskatchewan River Development Commission was created by an act of the Saskatchewan Legislature in 1959 to co-ordinate the development of this multi-use project and to assume functions for which no other agency is appropriate. The duties of this seven-man Commission include co-ordination, land use regulation and control and reservoir operation.

LOCATION OF SOUTH SASKATCHEWAN PROJECT



S.S.R.D.C. 1963

CO-ORDINATION OF PLANNING

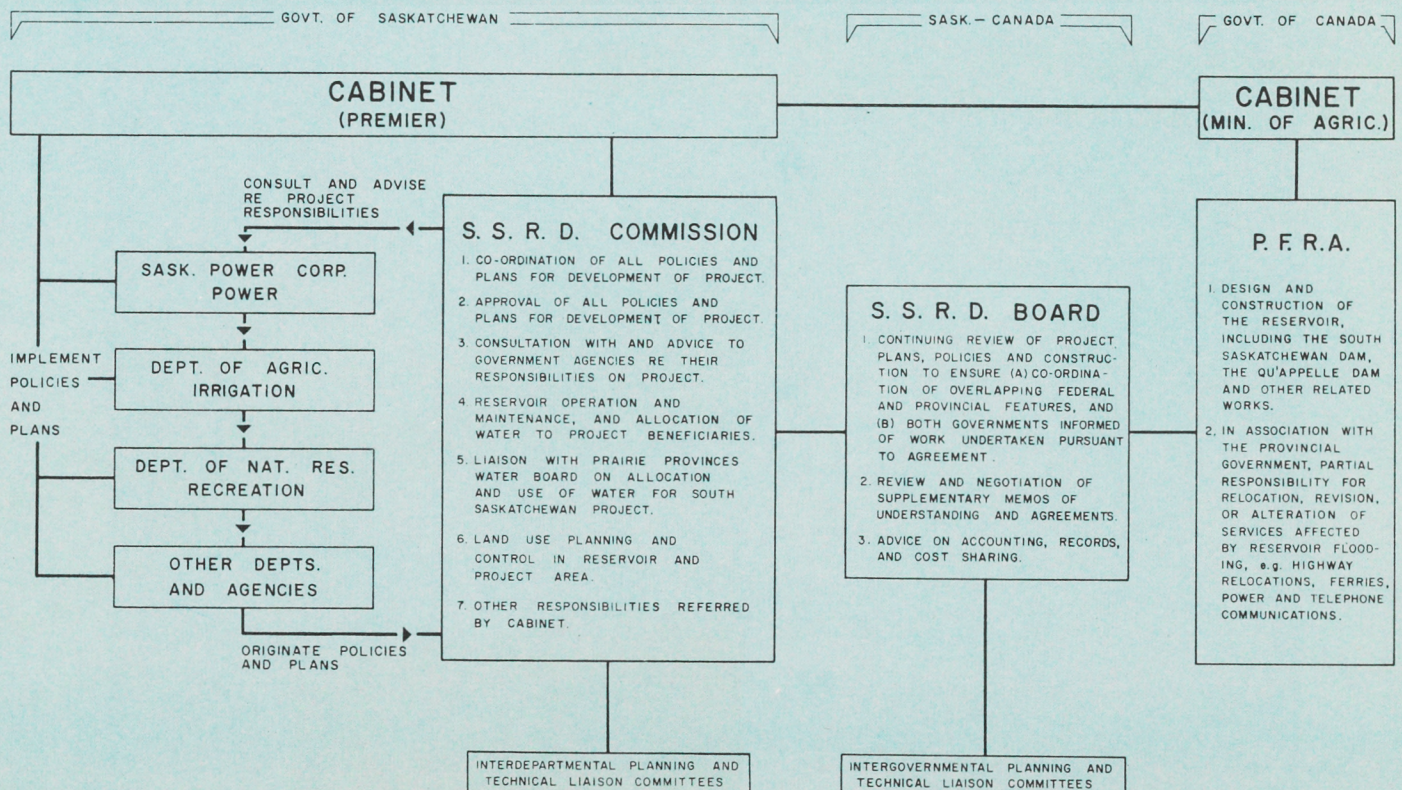
The Commission furthers project development with the co-operation of the various provincial agencies planning the benefits and acting in consultation with the Prairie Farm Rehabilitation Administration, which is the federal agency responsible for the design and construction of the reservoir.

The Commission reviews and approves the plans and policies initiated by the provincial agencies and ensures that their proposals conform with an integrated program and planning schedule. A number of major plans have been developed in this way during the past five years and are now serving as blueprints for the development of irrigation, power, recreation and other benefits. In the years ahead emphasis will turn increasingly toward implementing these plans.

Interchange of ideas, information and assistance between the federal and provincial governments has been a feature of the past five years. The 1958 Agreement provided for a South Saskatchewan River Development Board whose members are appointed by the two governments. The staff of the Commission acts as a secretariat to the provincial members of the Board.

Two special agreements are in final stages of negotiation between the governments and have been handled through the Board. The first, a supplementary agreement on power facilities, sets out in detail the components

SOUTH SASKATCHEWAN RIVER DEVELOPMENT PROJECT ORGANIZATION CHART



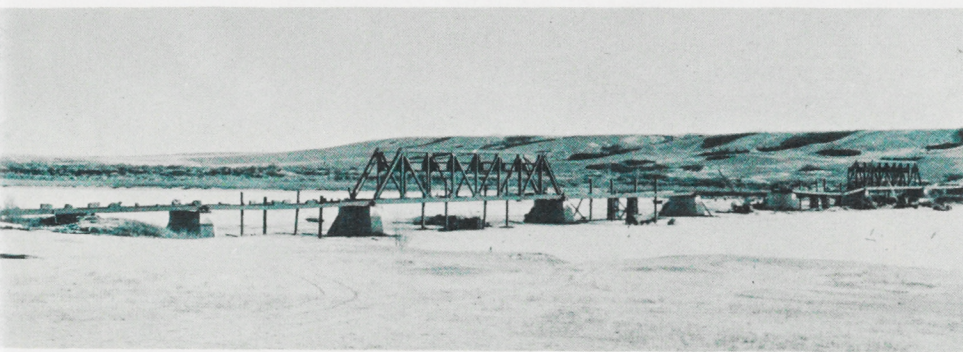
and financing of the power project and the precise responsibilities of each government. The second, a supplementary agreement on services, covers the revision and relocation of highways, roads, bridges, ferries, power and telephone lines from the areas to be flooded by the reservoir.

The two governments also co-operate in other aspects of the project. For example, lands acquired by the federal government for the reservoir will be transferred to the province upon completion of the reservoir. The scrub clearance plan is another example of federal-provincial co-operation. A plan to clear the reservoir of scrub and trees was prepared by the Saskatchewan Department of Natural Resources; the contract for this work was let by the Prairie Farm Rehabilitation Administration, and the costs will be shared by the two governments under the terms of the 1958 Agreement.



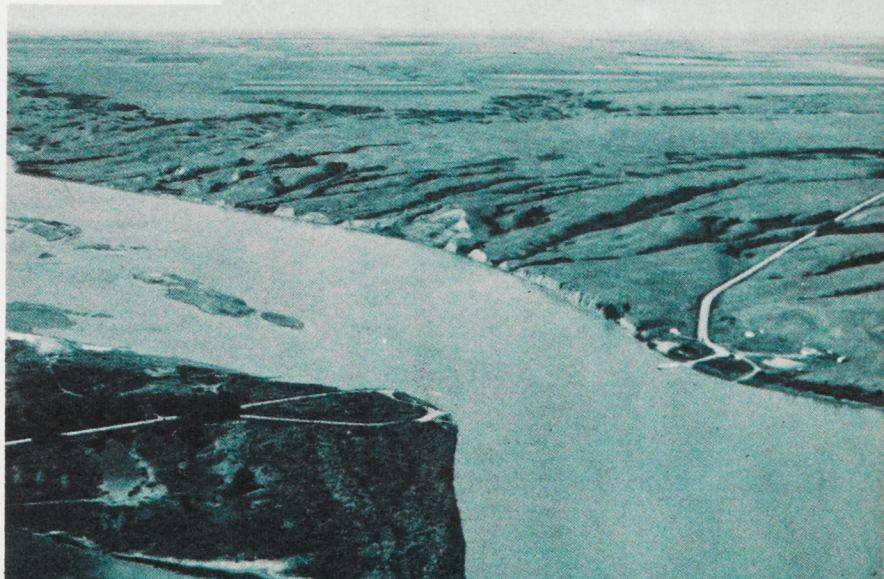
Elbow Bridge—"A landmark disappears due to reservoir flooding."

Sask. Govt. Photos.



The Riverhurst Ferry will also be affected by reservoir flooding. Waters will be 130 feet deep here.

Sask. Govt. Photo.



LAND USE

Land use control is needed to ensure that the shoreline development of the future reservoir takes place in a safe, efficient and attractive way. To achieve this, the Commission administers regulations designed to guide changes in land use in a limited area around the future reservoir shoreline. The reservoir will lie in what is now a predominantly rural area many miles from large centres of population. But it is expected that the presence of this body of water will attract a variety of land uses in future.

The need for land use planning was demonstrated early in the life of the project. In the area of the main dam, construction caused rapid changes in land use. A reservoir development area was designated in 1962 that includes the areas likely to be affected by construction near the two dams and also land adjacent to the shoreline of the reservoir. Within this area, regulations will ensure that damage to structures due to flooding, water action, slumping and sedimentation will be minimized and that shoreline developments will not seriously limit the operation of the reservoir for power, industrial and other purposes.

The current regulations reflect an early stage in land use planning. Most of the reservoir shoreline is still zoned for agricultural purposes. Later, industrial, commercial, recreation and other uses will be provided for within the zoning scheme as the need develops.

Certain lands adjoining the reservoir shoreline have been designated a restricted building area because of the threat of bank instability, sedimentation and periodic water action. Within this area new construction or the alteration of any structure must have Commission approval. Although some of the land is hazardous for certain types of building, construction may be permitted where the site is safe. In the remainder of the reservoir development area, Commission approval is needed for a change in land use and for new construction or alterations. Farm buildings are exempt.

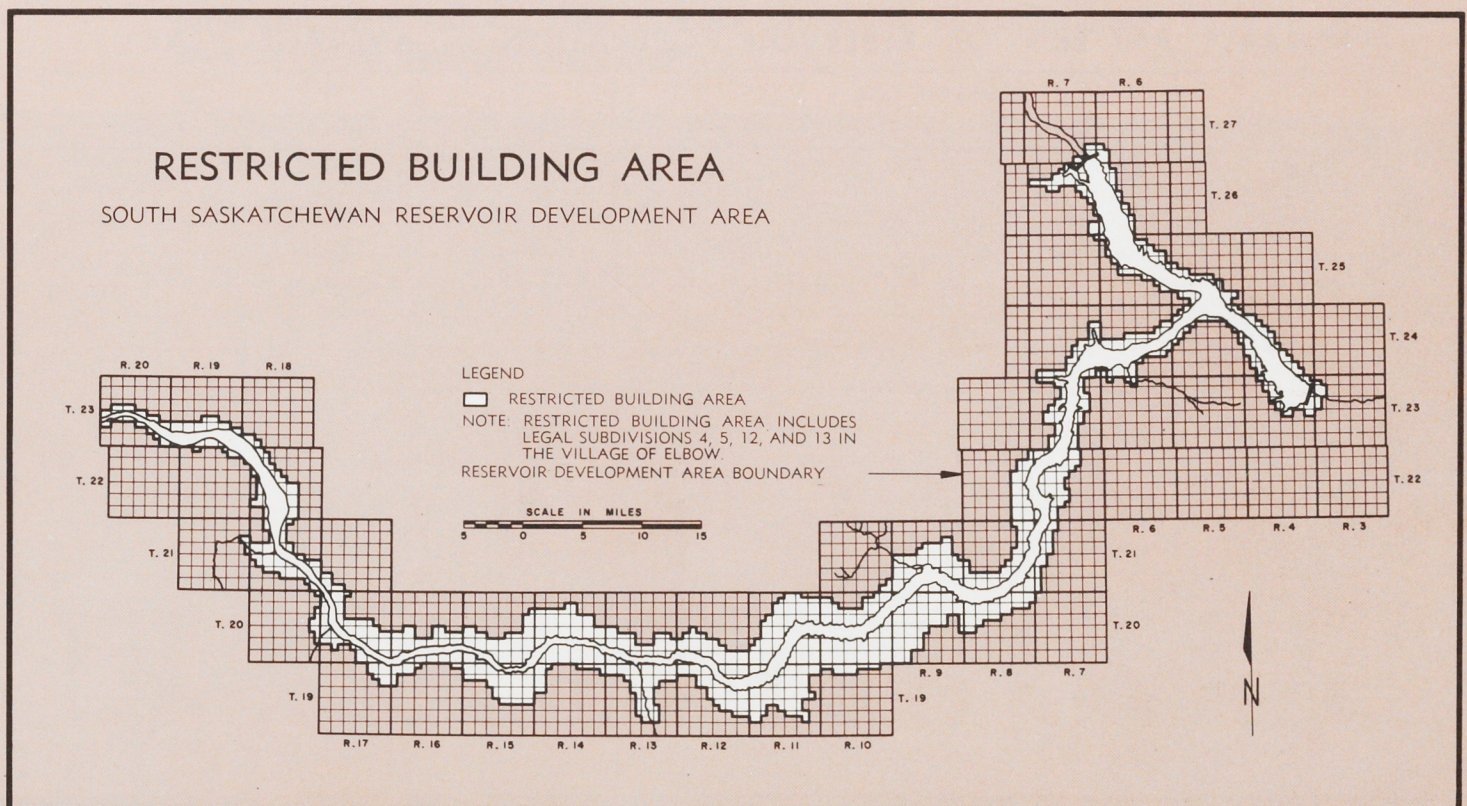
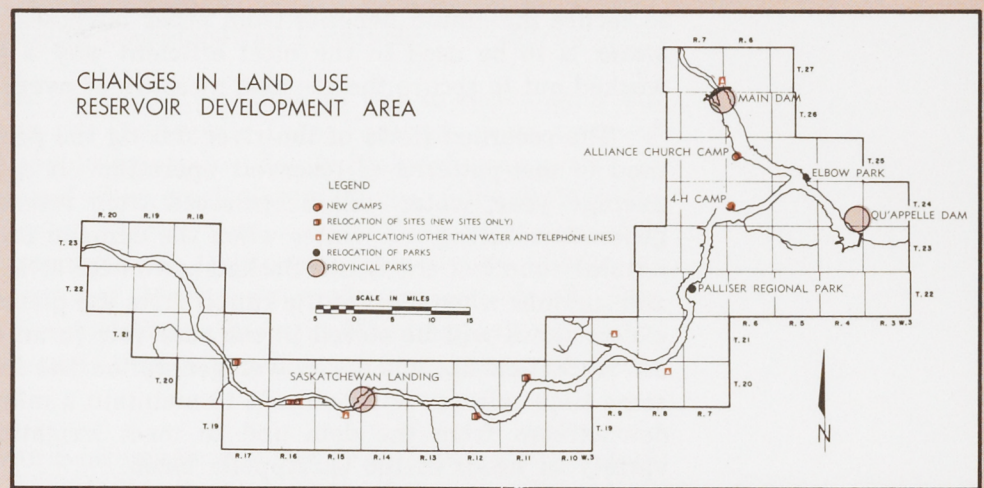
Land subject to slope instability near the reservoir margin.

Sask. Govt. Photo.



A number of changes have been introduced since the reservoir development area was designated. For example, a number of farms and ranches affected by reservoir flooding have been relocated on safe sites within the restricted building area. In addition, a number of recreation sites have been designated including a church camp, a local park and a regional park.

It is anticipated that the number of applications for changes in land use will increase as the reservoir nears completion. As the demand for different types of land use becomes apparent, a detailed land use plan will be developed.



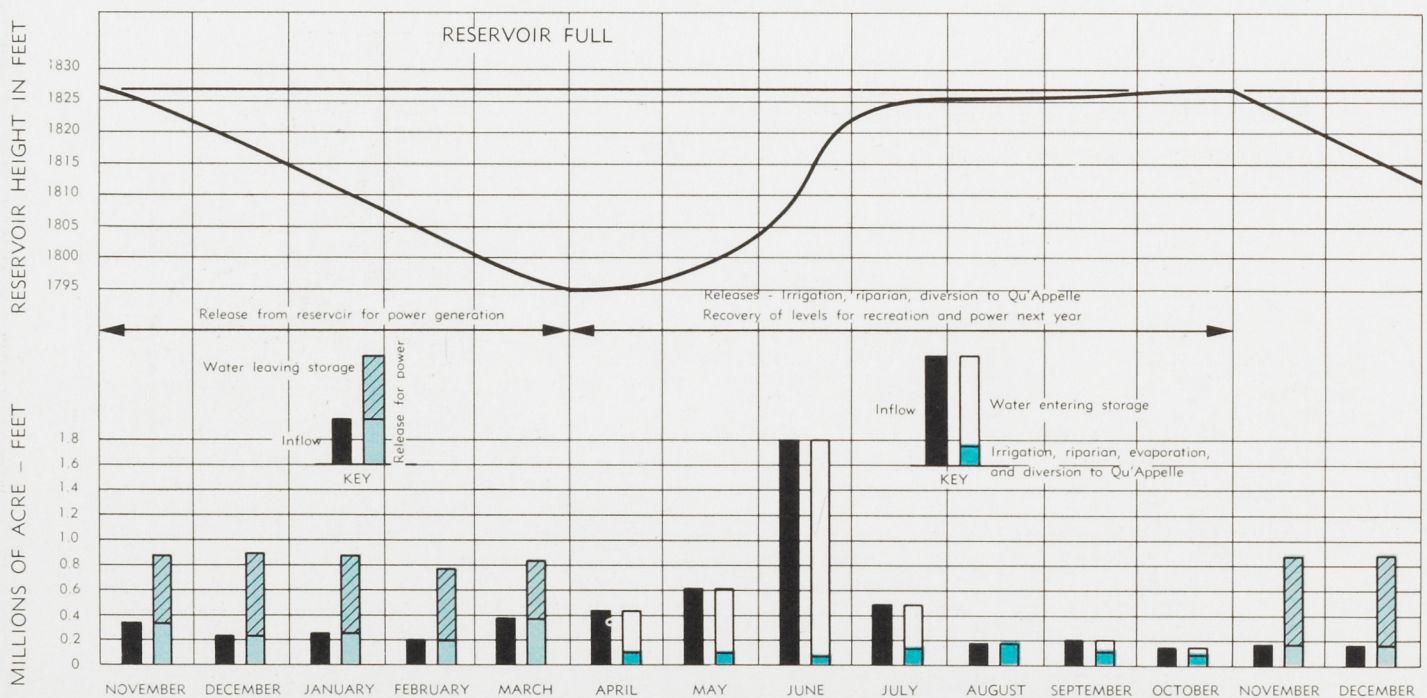
RESERVOIR OPERATION

When the reservoir is formed it will be possible to control the flow of the South Saskatchewan River. The huge storage capacity of the reservoir, some eight million acre-feet, will permit controlled releases of water through the main dam and through the secondary Qu'Appelle Dam to meet a variety of needs at different times of the year.

The Commission has been given the complex task of regulating releases from the reservoir. Water from the South Saskatchewan will serve a number of purposes such as irrigation, power, recreation, municipal and industrial supply. Operation of the reservoir to yield the greatest benefit from one purpose may be in conflict with the pattern of operation required to secure maximum benefits from other purposes. Therefore, if reservoir water is to be used in the most efficient way a plan must be carefully worked out to secure the greatest measure of overall benefits.

The recorded flows of the river during the past fifty years have been used to test patterns of reservoir operation. It appears likely that in an average year, water will be released from reservoir storage for power generation during the winter when the demand for power is high and the natural runoff of the South Saskatchewan River is low. During the spring and summer when most of the runoff from the plains and mountains occurs, excess flows will be stored in the reservoir in an effort to recover levels for recreation use and for power generation the following winter. At the same time releases will be made to maintain a minimum flow in the river downstream from the dam and to meet irrigation requirements and a variety of needs in the Qu'Appelle basin.

PROBABLE PATTERN OF RESERVOIR OPERATION — AVERAGE YEAR

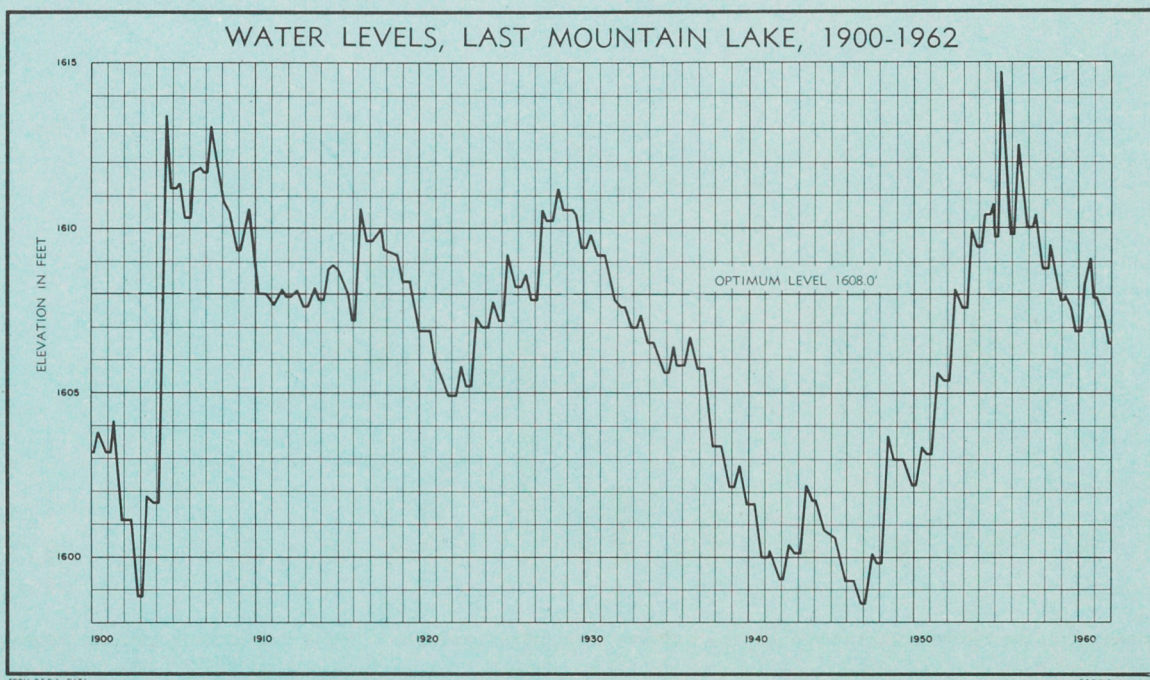


The operating pattern of the South Saskatchewan Reservoir will be linked with the operation of existing or planned reservoirs elsewhere in the Saskatchewan basin. Co-ordination with the many storage reservoirs and control works in the Qu'Appelle system will also be necessary.

Reasonably accurate forecasts of river flows in the Saskatchewan basin will assist in determining the operating pattern of the South Saskatchewan Reservoir in a given year. Forecasts will be made on the basis of reports from a network of stations scattered throughout the Saskatchewan basin. A number of these stations already are measuring streamflows, precipitation, temperature, evaporation and other meteorological data. A Commission study completed in 1963 suggested that more information will be needed from a greater number of stations to produce a useful forecast of river flows entering the South Saskatchewan Reservoir.

One of the early tasks facing the Commission was to recommend the size of the outlet works in the Qu'Appelle Dam. Forecasts were made of the present and future requirements for South Saskatchewan water to supplement the irregular and often small natural flows of the Qu'Appelle River. It was found that in an average year, natural flows meet only 45% of existing water requirements in the Qu'Appelle. This picture of scarcity becomes even more startling if Manitoba's needs are considered. The Qu'Appelle empties into the Assiniboine basin in Manitoba—also a water-short area, which would benefit from water diverted from the South Saskatchewan.

The diversion of South Saskatchewan water to maintain the levels of the Qu'Appelle lakes would undoubtedly improve these water bodies, which are of major importance for recreation. In a recent study, the Commission attempted to estimate the value of water diverted from the reservoir and used for this purpose. It was found that the value of water diverted specifically for recreation purposes to the Qu'Appelle chain of lakes compared favourably with the value of water diverted for alternative uses elsewhere in the Saskatchewan system.



GAUGING NETWORK IN THE SASKATCHEWAN AND QU'APPELLE BASINS





Measuring sediment carried by the South Saskatchewan River at the Lemsford Ferry Hydrometric Station.

Sask. Govt. Photo.

Downstream from the South Saskatchewan Dam a number of users rely upon the river flow for water supply; among others, the town of Outlook, the city of Saskatoon and the Queen Elizabeth power station. In addition a number of ferry services cross the river and these require a certain minimum flow to operate. It is recognized that very low flows will create problems for a number of downstream users. On the other hand a Commission study undertaken in 1963 indicates that there is an inverse relationship between water released through the South Saskatchewan Dam and the value of benefits that can be derived from the reservoir. Consequently, a minimum release has been recommended and work begun to discover what this may mean for downstream water users.

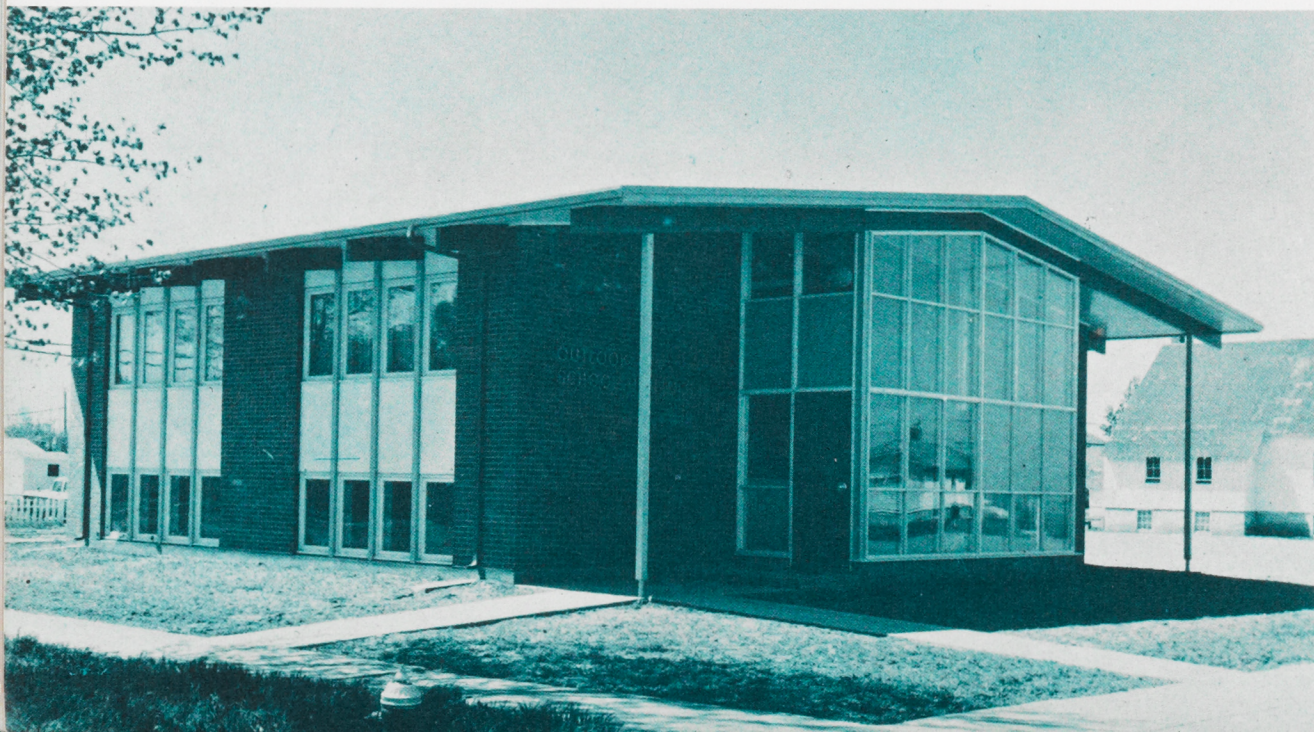
SPECIAL STUDIES

The Commission has undertaken a number of special studies related to project planning. For example, the economic effect of the project upon the surrounding area has been the subject of an annual review by the Commission. The latest review indicated that during 1963 employment on construction was again high, reaching a peak of 1,174 persons. The early winter of 1963 has shown little decline in the work force although work on the diversion tunnels, which had maintained the winter work force in past years, was virtually completed. Preparations for diversion of the river largely account for this. During the coming summer, peak employment will be somewhat below 1963 levels and the employment peak has now passed.

The stimulus of construction employment and expenditures to the economy of the area surrounding the main dam has resulted in a high rate of new public and private investment and an active retail trade. New and renovated stores, improved roads, and new water and sewerage systems in towns and villages are evidence of the prosperity that project construction has brought to the area.

Work at the main dam has stimulated construction of commercial and public buildings in the surrounding area. The Outlook School Unit provides education facilities for children of construction workers.

Sask. Govt. Photo.



PUBLIC INFORMATION

The Commission conducts a public information program concerning progress on the project, using the information services of the provincial government and working jointly with the federal government.

An observation pavilion at the construction site of the main dam houses federal and provincial displays designed to give the visitor a picture of the size and scope of the project. The pavilion was visited by 75,000 people in 1963. Lookout points will be established at the site of the Qu'Appelle Dam in time for the 1964 recreation season and picnic facilities are available at the main dam site. The two governments also sponsor a joint booklet on the project which has been distributed in one hundred thousand copies. The public are further informed of important progress through press releases.

Members of the Commission and the staff receive requests for speaking engagements before both professional and non-technical groups, and the staff has contributed articles concerning various aspects of the project to professional journals from time to time.

A half-hour colour documentary film "Harnessing the South Saskatchewan" was produced for the Commission during 1963. The film tells the story of the project—its construction, and the benefits that are being developed. Copies of this film can be secured from the Visual Education Branch, Saskatchewan Department of Education, Regina.

Part of the province's display in the Observation Pavilion at the South Saskatchewan Dam site.



P.F.R.A. Photo

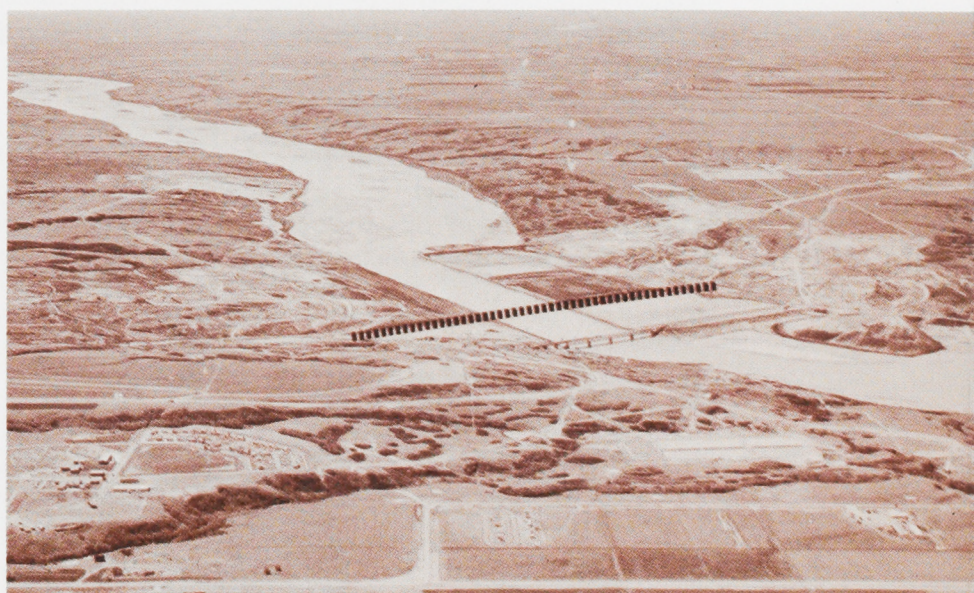
PROGRESS TO DATE

The Prairie Farm Rehabilitation Administration is the federal agency responsible for the design and construction of the two rolled-earth dams necessary to form the reservoir. Work began at the site of the main dam late in 1958 and by the end of 1963 thirty-eight contracts had been let with a total value of \$78.7 million or 79% of the estimated final cost of \$99 million. Actual expenditures on construction of the dams and reservoir to the end of 1963 are shown in the chart over page. Details of contracts let to date may be found in Appendix II.

Construction of the rolled-earth embankment at the main dam was begun in the spring of 1959 and has been divided into five major stages. Four of the five stages have been completed or are in the course of completion.



The site of the main dam before construction was begun.



1960 — centre line of dam marked.

1961

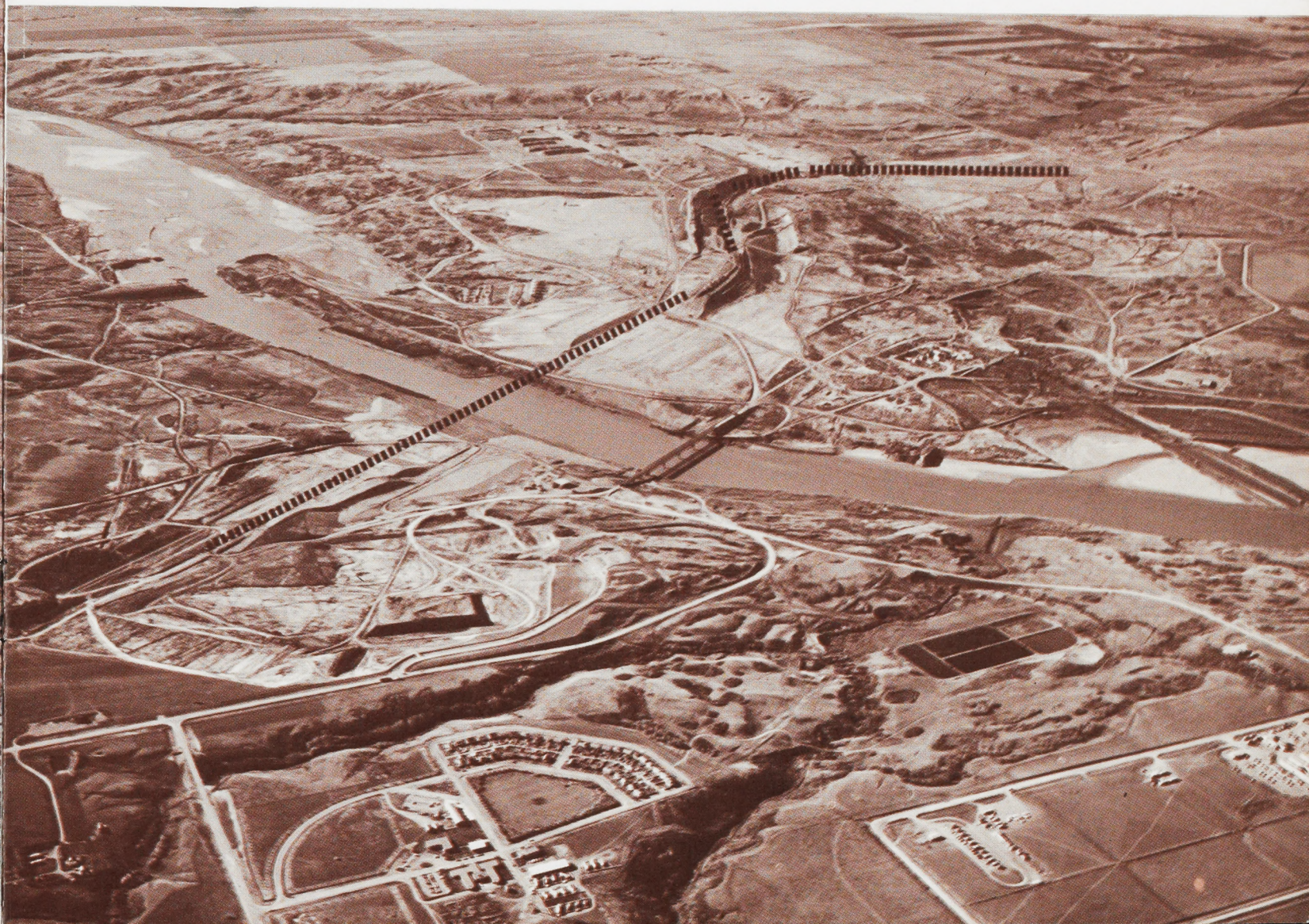


P.F.R.A. Photos.

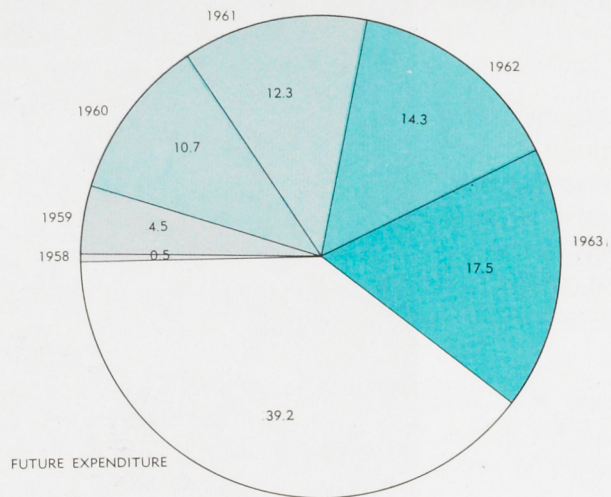


1962.

1963—centre line of dam marked.



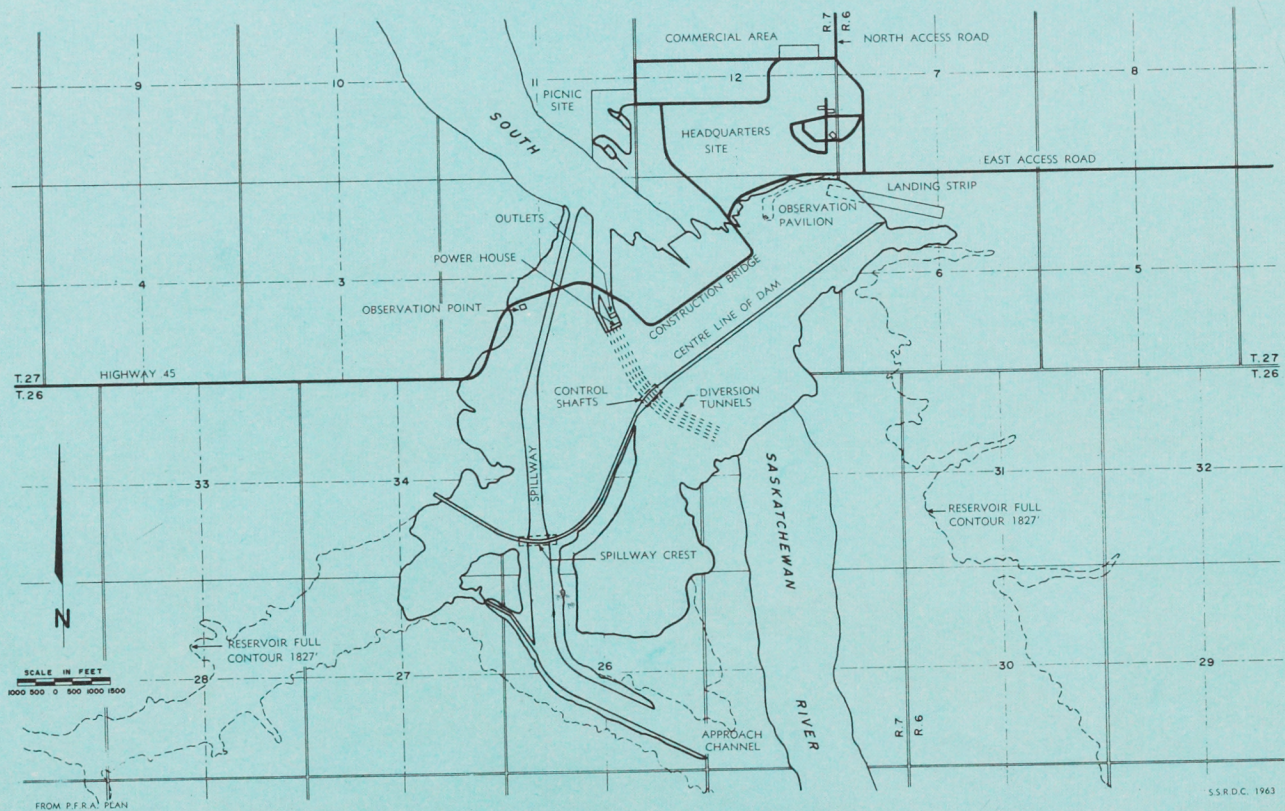
SHAREABLE EXPENDITURES ON RESERVOIR CONSTRUCTION (MILLIONS OF DOLLARS)



The estimated final cost of construction is \$99 million,
shareable, 75% by Canada, 25% by Saskatchewan

© S.S.R.D.C. 1963

CONSTRUCTION AREA — SOUTH SASKATCHEWAN RIVER DAM



© S.S.R.D.C. 1963

Stages I and II involved raising the embankment on the east and west sides of the river to about one-half their final heights of 210 feet. The river bed was narrowed by this work to an 800-foot wide channel on the east side. During the third stage, work was concentrated on the west side of the embankment and its extension across Coteau Creek.

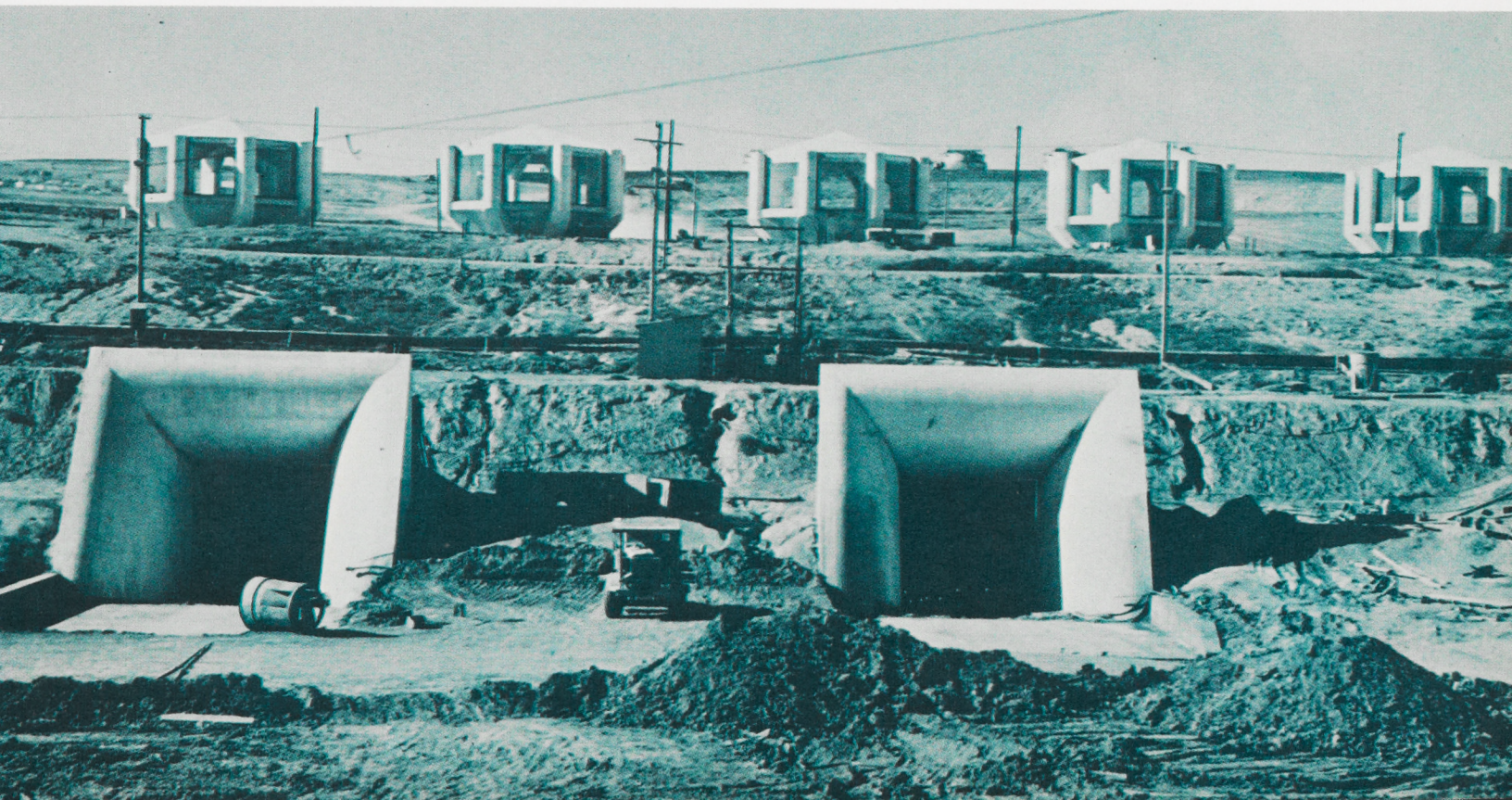
Preparations for river diversion are now being made under Stage IV of embankment work; the river channel is being reduced to a width of 400 feet, the east embankment is being further raised in height and a coffer-dam is being built to divert the flow of the river and protect the base of the main dam from floodwater.

Five diversion tunnels have been constructed to carry water from the dam so that river flows can be maintained during and after completion. Excavation of these 25-foot diameter tunnels through the west embankment began in 1960. All tunnels have been lined with reinforced concrete. In addition, the downstream halves of the three riverward tunnels, which will also serve as power penstocks, have been reinforced by steel liners. The tunnels were virtually complete by the end of 1963, and will be used initially to carry the flow of the river during 1964 and 1965 so that the river channel can be closed and the dam completed.

During 1963, work began on two contracts valued at \$7.2 million for construction of a spillway around the dam. The spillway will be used only as an overflow in periods of extreme flood. Normal releases from the reservoir will pass through high level intakes into the diversion tunnels and return to the river channel at the downstream toe of the dam.

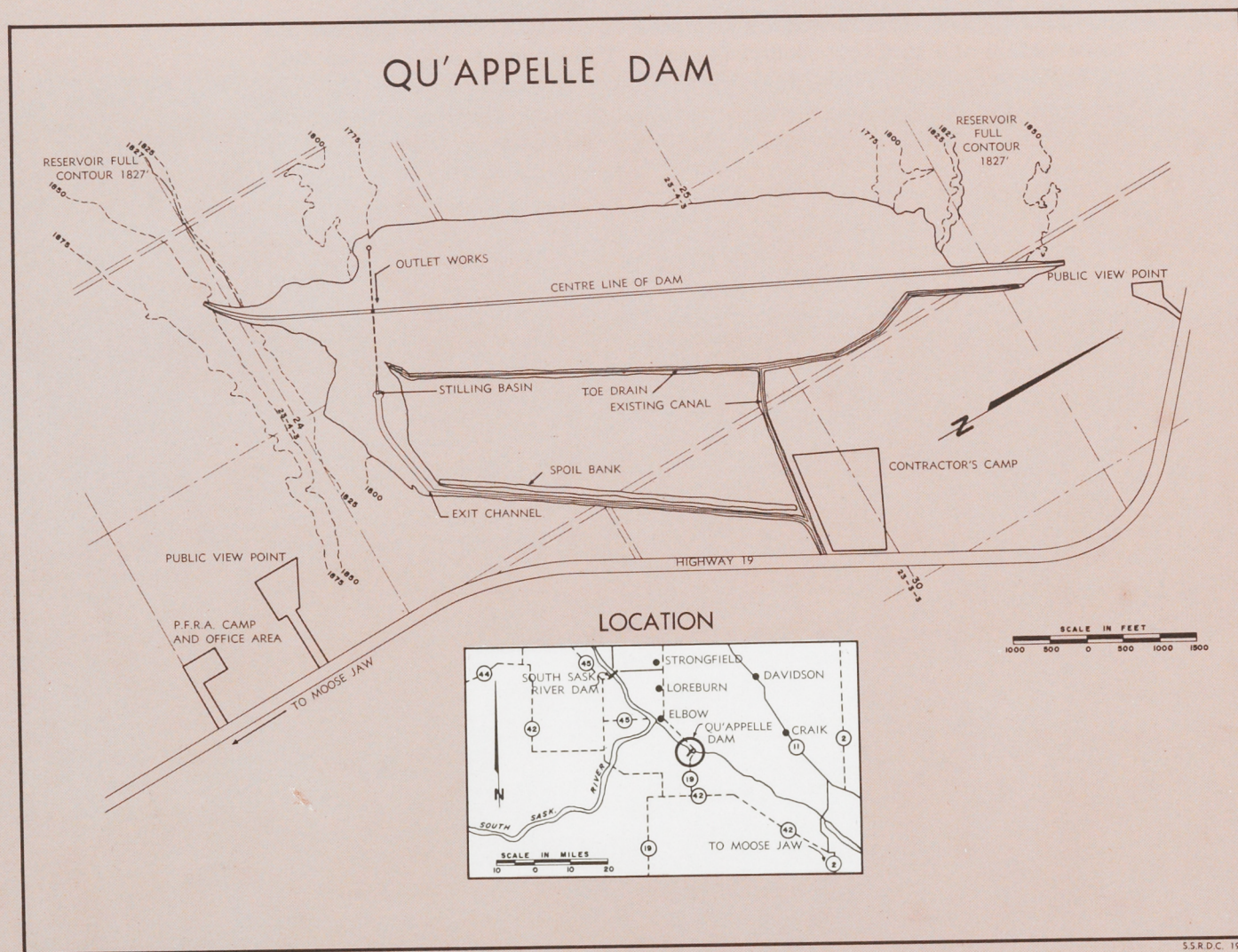
Intakes to diversions tunnels. Low level diversion intakes in foreground are 550 feet from permanent intakes behind and 2,000 feet from the control shafts which are just visible in background.

P.F.R.A. Photo.



The flow of water will be controlled by massive gates, each weighing 46½ tons, placed in control shafts located on the centre line of the dam and connecting vertically with the five diversion tunnels. Each shaft will contain two gates as a safety measure, but only one will be operated at any given time. The gates themselves, the hoists and other parts for the control shafts must be installed before diversion can take place early in 1964.

A major step towards reservoir completion was taken in 1963 with the start of the largest single contract. Late in the fall, work began on construction of the secondary Qu'Appelle Dam located in the Qu'Appelle Valley a few miles east of Elbow. On completion, this dam will be 9,000 feet long, 90 feet high and will contain 7½ million cubic yards of earth material. The contract, valued at \$9.6 million, is expected to be completed in the fall of 1965.

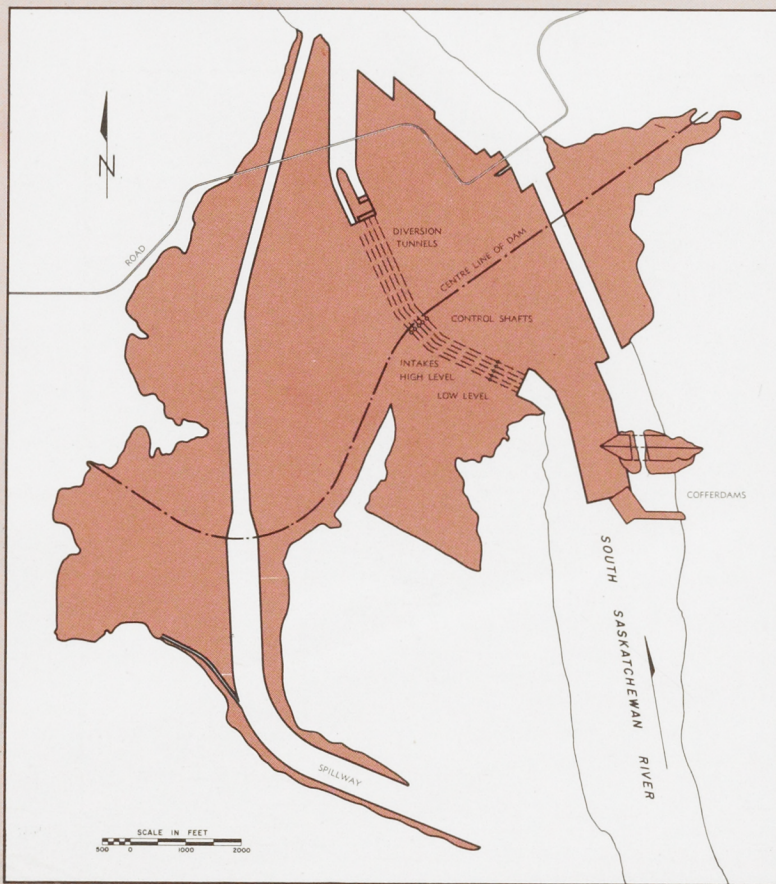


FUTURE WORK

Three major tasks remain to be carried out before the reservoir can be filled to operating level. The river must be diverted and closure of the main dam effected; the main dam must be topped off in a fifth stage of embankment work; and construction of the Qu'Appelle Dam must be completed.

The river is currently scheduled to be diverted during February, 1964. At this time the river will be diverted through the five tunnels via low level intakes and the natural channel will be closed. As the spring flood occurs, the diversion tunnels will not be sufficiently large to carry the whole of the peak flow and water will pond back behind the dam. A cofferdam will therefore be thrown up to protect the new fill placed in the closure section from flood damage. The ponded water will then be released during the summer as river flows permit.

DIVERSION STRUCTURES - SOUTH SASKATCHEWAN RIVER DAM



Construction area of main dam from south as it appeared late in 1963. Course of the five diversion tunnels marked. Cofferdam in right foreground nearing readiness for diversion to take place.



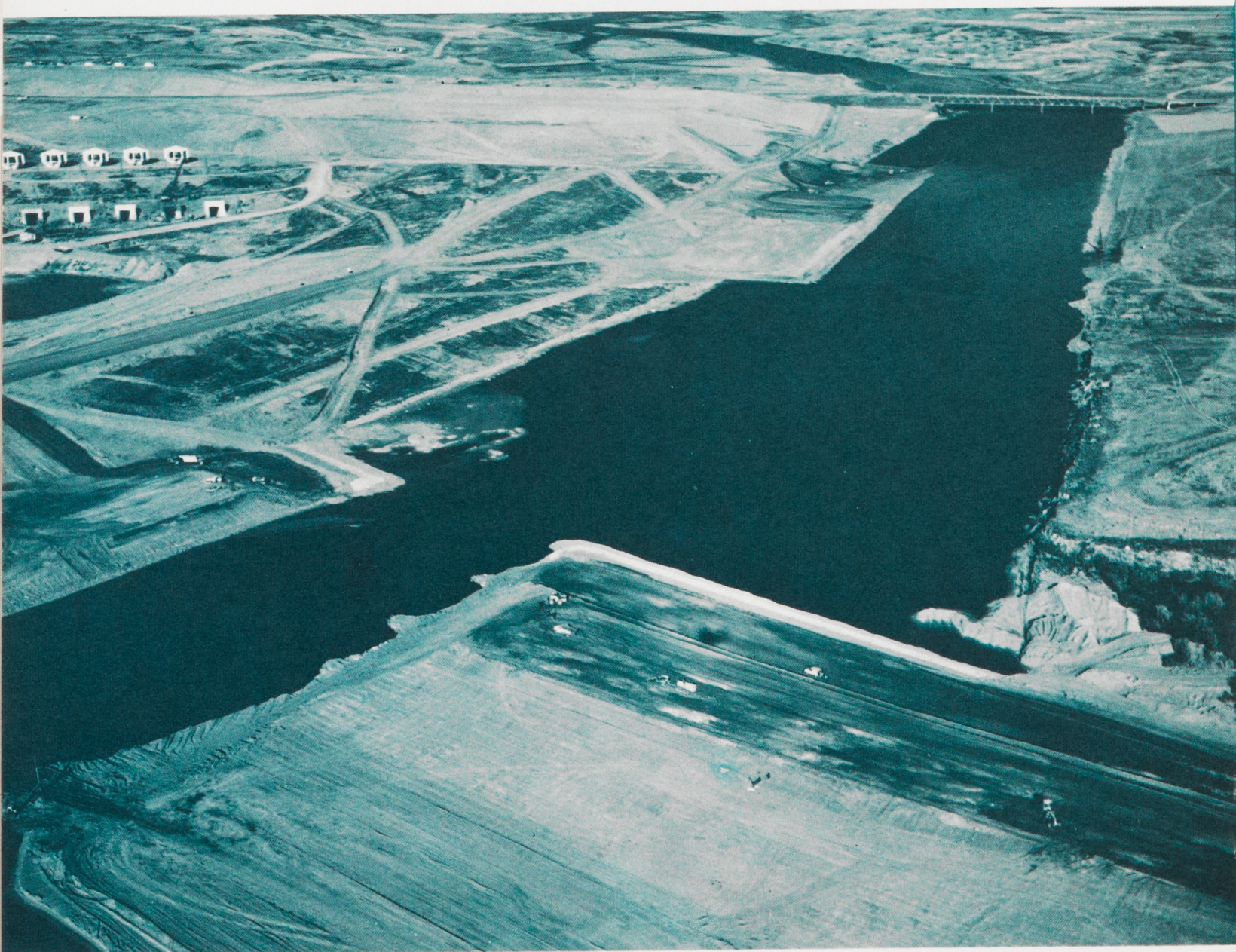
P.F.R.A. Photo.

By the spring of 1965, the main dam should be near its final height over much of its three-mile length if the current construction schedule is maintained. By the fall of 1965 the Qu'Appelle Dam should be completed and the main dam topped out.

Assuming that this schedule is achieved the reservoir may be filled by late 1966, but this will depend upon river flows during the filling period. The Commission completed a study during 1963 which showed that there is only a 10% chance that the full level will be reached by August 1, 1966, but a 50% chance exists that it will be reached by mid-1967.

River closure in preparation, late 1963; cofferdam in foreground.

P.F.R.A. Photo.



IRRIGATION

Chapter III

Years of planning must precede the first release of water onto the land if a large irrigation project is to be successful. Five years ago the Saskatchewan Department of Agriculture began to study the irrigation proposal in detail, and by 1963 the main outline of the irrigation scheme had been prepared.

ACREAGE

To help establish the size and extent of the irrigable acreage, a detailed soils survey of 2.6 million acres of land was carried out. Thirty thousand soil samples were obtained and analysed in the laboratory to measure factors important to irrigation such as sub-surface drainage and salinity. By the end of 1962 the boundaries of a number of irrigable blocks had been established.



P.F.R.A. Photo.

Sask. Govt. Photo.



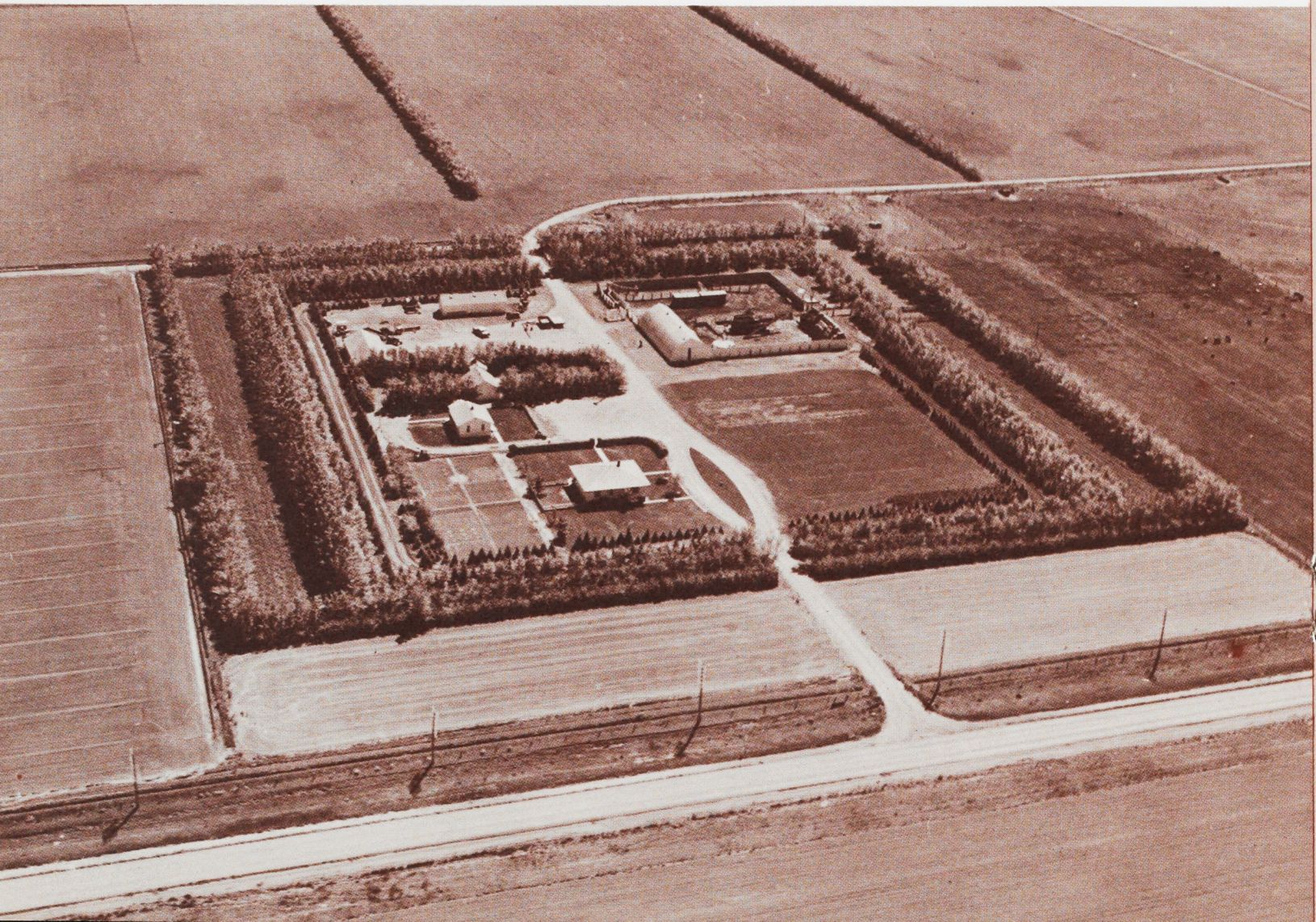
Irrigable land is divided into three main blocks downstream from the South Saskatchewan Dam, one on the east side and two on the west side of the river. Several additional small areas separate from the main blocks are also suitable for irrigation.

The block on the east side, known as the Outlook-Broderick area after the two communities on which it centres, contains about 36,000 acres of irrigable land. The two main blocks on the west side of the river contain about 165,000 acres, of which over 77,000 acres are located in the Conquest-Donavon area and nearly 88,000 acres in the Vanscoy, Asquith, Tessier and related units.

Thus, at the present time, about two hundred thousand acres of land are considered irrigable. The irrigable land has been selected partly on the basis of physical suitability, but economic and technological factors have also been taken into account. The estimate of one-half million acres originally considered irrigable was reduced because large areas were found to be unsuitable for sustained irrigation under present methods. As economic and technological factors change it may be feasible to extend the irrigable acreage on the South Saskatchewan Project in the future.

The federal pre-development farm at Outlook. Established in 1949, the farm serves as a proving ground for irrigation practices in the heart of the area selected for irrigation.

P.F.R.A. Photo.



IRRIGABLE AREAS OF SOUTH SASKATCHEWAN PROJECT



SYSTEM DESIGN

A detailed topographic survey of 620,000 acres is being used by Saskatchewan Department of Agriculture engineers to prepare designs for distributing water to the irrigable lands. The location of main canals, smaller distribution canals, field ditches and drains are being carefully prepared to suit the contours of the land. Water must distribute itself evenly over the land by gravity. Before water is released onto the land, many fields may require levelling by skimming part of the topsoil from one location and placing it in another to produce a uniform grade or slope.

A pumping plant will be located on the east embankment of the main dam to serve the Outlook-Broderick area. Water will be pumped into a high level main canal which will follow the east boundary of the block. It will then flow by gravity via this canal to a regulating reservoir near Broderick and from there via another canal to the northern part of the block.

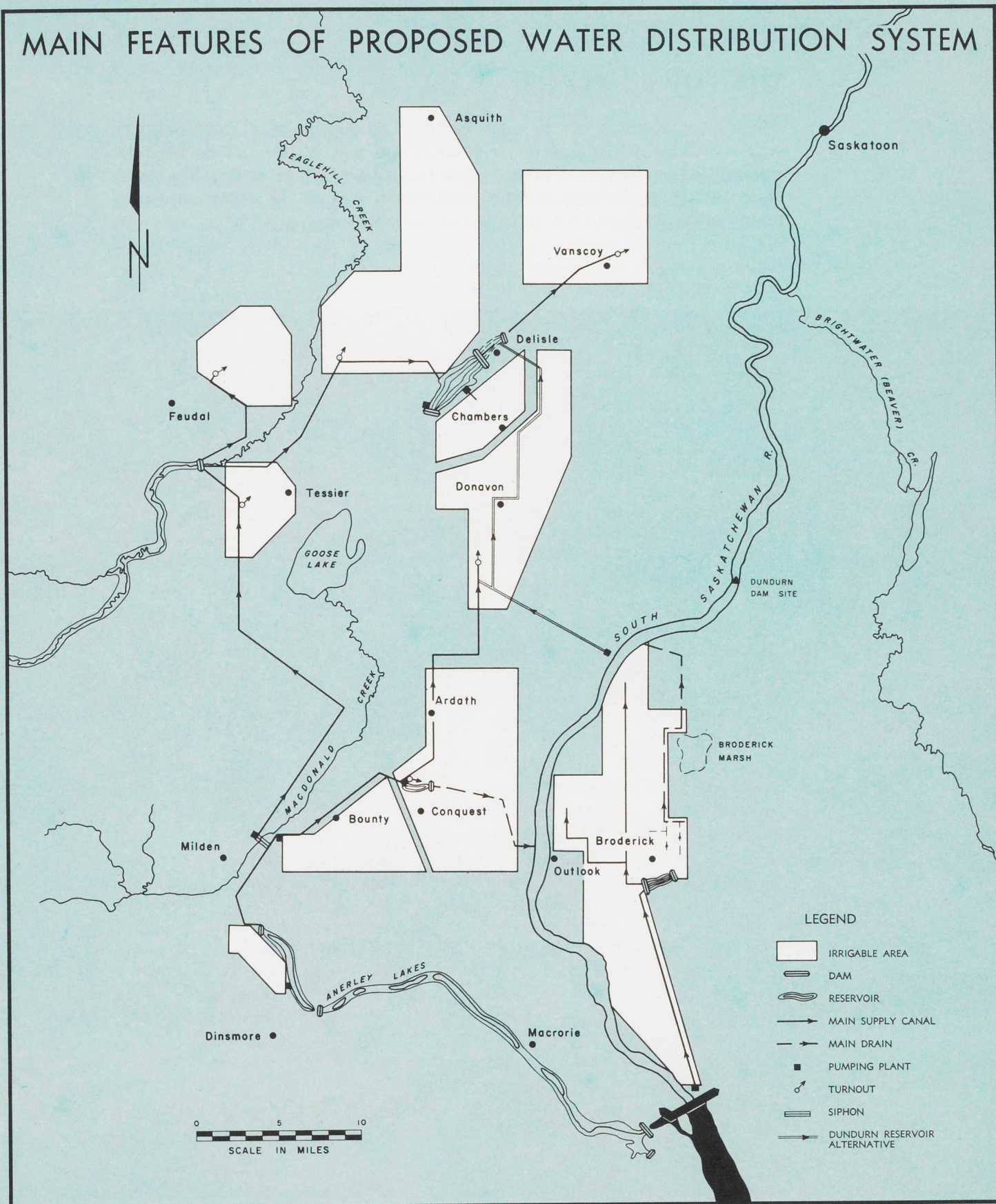
On the west side the various irrigable blocks will probably be developed by stages. A likely alternative for serving the blocks on the west side is a system calling for a reservoir in the Anerley chain of lakes. This would be created behind a dam constructed across the Coteau Creek Valley a few miles west of the South Saskatchewan Dam. Water would flow by gravity from this reservoir to the Conquest and Donavon areas and later, in a second stage, to the Tessier, Asquith, Vanscoy and related units.

Another possible alternative may be introduced to service the Donavon, Delisle-Chambers and Vanscoy areas which may be served by a main canal originating at the South Saskatchewan River southeast of Swanson. This alternative has a number of advantages, but it would be dependent upon the creation of another reservoir on the South Saskatchewan River west of Dundurn.

The Saskatchewan Power Corporation has also been considering a reservoir in the Anerley chain as a pumped-storage power scheme. Power would be generated when needed during peak hours and at off-peak periods the turbines would be reversed to serve as pumps which would lift water from the South Saskatchewan Reservoir into the Anerley Reservoir. Certain cost savings could be achieved by combining the irrigation and power schemes in the Anerley chain and construction would be most economical if the development of the irrigable areas on the west side could be timed to coincide with construction of the Anerley power scheme.

Under the current schedule it is not anticipated that irrigation will begin before 1968 at the earliest and it may be delayed until 1969 or 1970. Three or four years will be required however to construct the irrigation system once design work has been completed. Prior to construction, the areas to be serviced first must be selected and a land and irrigation development policy acceptable to the government and the farmers must be determined.

MAIN FEATURES OF PROPOSED WATER DISTRIBUTION SYSTEM



THE POWER PLANT

The construction of the main dam on the South Saskatchewan River will create an artificial drop or head of 170 feet which can be used to generate hydro power. A power plant to take advantage of this head will be located on the downstream toe of the main dam on the west side where the diversion tunnels emerge from the embankment.

Outlets for diversion tunnels: The initial power installation will be located over the three riverward outlets at left.

P.R.F.A. Photo.



The power plant will be developed in two stages. The first stage is now in progress consisting of three turbo-generators with a combined rating of 250,000 horse-power. The first stage will use three of the five diversion tunnels. At a later date a second stage using the remaining two tunnels will bring the ultimate size of the plant to 400,000 horse-power. The cost of the power facility for the first stage is estimated at \$26 million.

A number of unusual problems have had to be faced and solved in the design stage and the details of the plant are now being finalized. A study of the foundations of the plant showed that ballast chambers, the weighing of which could be adjusted as required, may be built into the toe end of the plant to maintain stability. The stability problem may also ensure that the two additional generators, when added, will be installed in a completely separate plant.

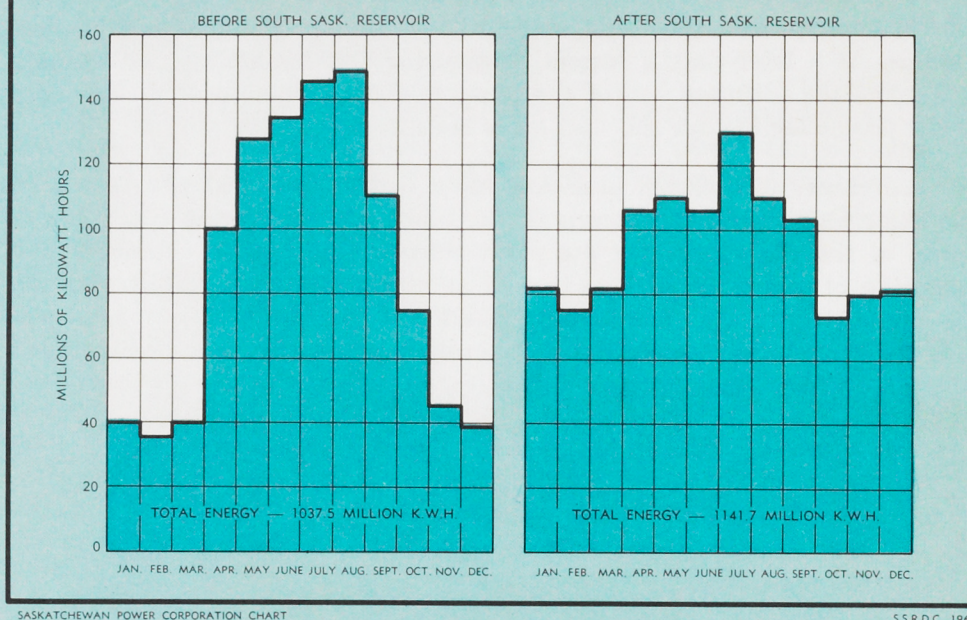
The generators at the plant will not be used continuously; rather they will be closed down or started up to meet the pattern of electrical demand in the system. When the tremendous force of water flowing through the tunnels is shut off, a water hammer or surge effect will be created in the tunnels. The usual way to absorb this effect is to build-in surge tanks—columns rising high above the plant. A less expensive solution will be adopted for the South Saskatchewan plant by incorporating special features into the turbines.

Facilities for the general public to view the generating hall and main control panels will be included in the design of the power house. As presently planned, a visitors gallery will run the full length of the generating hall. Display material will be housed in the building to explain the operation of the plant and how it will fit with other power plants into the provincial power grid.

The Coteau Creek Hydro Electric Station is expected to generate the major part of its annual power output during winter when the province's demand for power is high. During the summer the plant will be used in the system mainly to meet demands at the peak hours of each day. The large storage capacity of the South Saskatchewan Reservoir will make the plant a flexible unit and, unlike coal-fired plants, it will be capable of generating a maximum amount of power on short notice when power is most needed. In this respect the plant will add to the flexibility and efficiency of the provincial power generating system.

Power generation at existing and future hydro plants downstream from the reservoir will also be improved by the regulation of river flows. The following diagram shows that controlled releases from the South Saskatchewan will increase power generation at the Squaw Rapids plant by 11% in an average year. In a dry year an increase of 34% will be achieved by controlled releases through the South Saskatchewan Dam.

ENERGY AVAILABLE AT SQUAW RAPIDS — AVERAGE YEAR

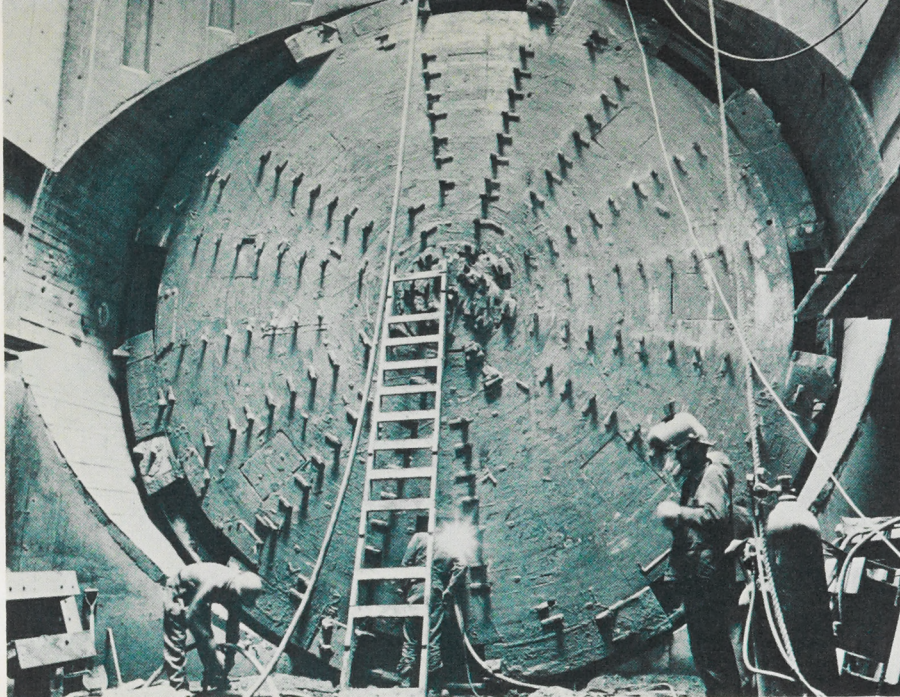


CONSTRUCTION PROGRESS AND FUTURE SCHEDULE

Work began on the power facility in 1960. Steel liner for the three diversion tunnels to be used as power penstocks was fabricated and then delivered to the site and installation in the diversion tunnels began in 1962. The liner, 20 feet in diameter, was placed in the downstream halves of the tunnels in sections 40 feet in length. The work was completed late in 1963.

Two contracts were let during 1963 for supply, delivery and installation of three 84,000 horse-power turbines and three generators. Detailed design work on the power plant has continued during the year and tests of a model of the tailrace have been completed.

Under a new schedule, the contract for power plant construction will likely be let in the spring of 1965 with construction beginning in the fall of that year. The first two units will be installed by August, 1967, and the third unit during 1968-69. The original construction schedule has thus been postponed by one year to effect certain savings by better integration with the construction schedule of the main dam. While the power project at the main dam will be postponed for one year, installation of additional units at Squaw Rapids may be advanced by one year to meet the expected power demand in the province.

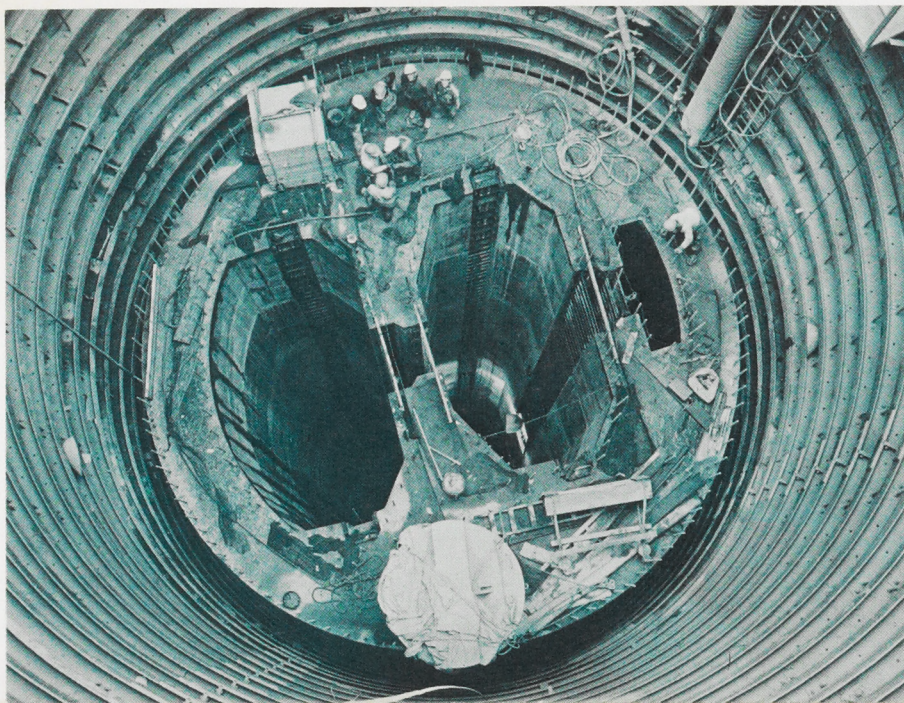


The 'Mole,' giant machine used to mine the diversion tunnels at the main dam.

Steel tunnel liner ready for installation in the downstream sections of the diversion tunnels. The lined tunnels will serve as power penstocks.



Massive gates installed in these shafts will regulate the flow of water through the diversion tunnels to the power turbines.



RECREATION POTENTIAL

The waters of the reservoir will form a man-made lake 140 miles long with a shoreline of nearly 500 miles. This huge body of water will be located in an area where there are no large natural water bodies and where recreation resources of any kind are at a premium.

The fine recreation possibilities offered by the presence of the reservoir have caused the provincial government to undertake a major program to develop recreation sites. The program will be of direct importance to nearly half the people of the province. About 400,000 people live within 100 miles of the reservoir, the majority of whom have limited outdoor recreation opportunities open to them.

The Commission hired a consultant in 1959 to prepare a report on the recreation potential and to develop a master plan of development. The report set out in general terms areas suitable for provincial parks, regional

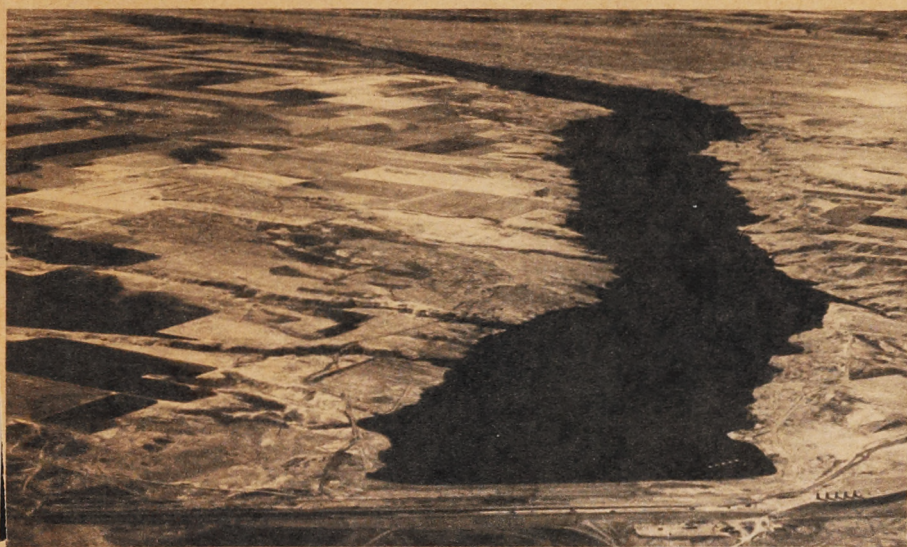


W. M. Baker, Recreation Consultant, at work on recreation survey of reservoir shoreline, 1959.

Sask. Govt. Photo.

COMING SOON: open water in the wheatlands

By E. N. Davis



Canada Dept. of Agriculture

Swelling slowly behind the huge earth dam in the foreground, 140-mile-long Lake Saskatchewan is creating a new water playground in the heart of the prairie dry-belt, extending almost to the Alberta border.

Most of south-central Saskatchewan's population will soon be boating on a new lake now swelling out over the wheatfields. Rising behind one of the largest rolled-earth dams in the world is the South Saskatchewan reservoir. It will become a lake 140 miles long, up to four miles wide, with a shoreline of 500 miles.

Almost two-thirds of the population of Saskatchewan lives within 150 miles of the new lake, which lies just west of the mid-point between Regina and Saskatoon. When it is finally filled – this spring or next, depending on the weather – Lake Saskatchewan will be the largest in the western flatlands.

Its prime functions, of course, are irrigation and power generation, but it will also become an oasis for pleasure boating enthusiasts. What's happening in Saskatchewan, right now, is a boating explosion, and Lake Saskatchewan comes at precisely the right time.

There are 20,000 licenced power boats in the province, an average of one for every 13 families. Almost 5,000 vessels are registered in Regina alone, though the nearest usable body of water is 40 miles away. (Wascana Lake, a glorified, artificial duck pond in front of the legislative building, became so congested with power boats and water skiers, that they had to be banned.)

Beginning this year, Lake Saskatchewan provides frustrated boaters in the southern half of the province with a glorious outlet. Landscape architect C. DeForest Platt of Omaha, Nebras-

ka, has been retained to design three provincial parks that are being created in the area – one for the South Saskatchewan dam, the second for the Qu'Appelle River dam, with the third to be located about 100 miles to the west and 30 miles north of Swift Current and the Trans-Canada Highway.

Cottage subdivisions are being mapped out and a number of regional parks will be established. Four boat-launching ramps are ready for use when the reservoir fills. One of these ramps, near the main dam, about 20 miles north of Elbow, is a concrete ribbon 60 feet wide. It cost \$15,000, and it includes a crib on an inclined rail for launching heavy boats.

Saskatchewan's department of natural resources is preparing camping sites and picnic grounds around the new shoreline. Many of these sites will be accessible only by boat, which means that families can take extended holiday cruises entirely away from road traffic. RCMP and resources department vessels will be stationed on the lake, in constant radio communication with shore stations. A patrol plane may also be provided as a safety measure.

Boaters used to water conditions on the shallower, smaller and more sheltered lakes in the southern part of the province will have to learn to be prepared for quick storms that will kick up waves 12 feet high on the open waters. But boats will never be more than two miles from shelter on a shoreline that is dotted with hundreds of bays and inlets.

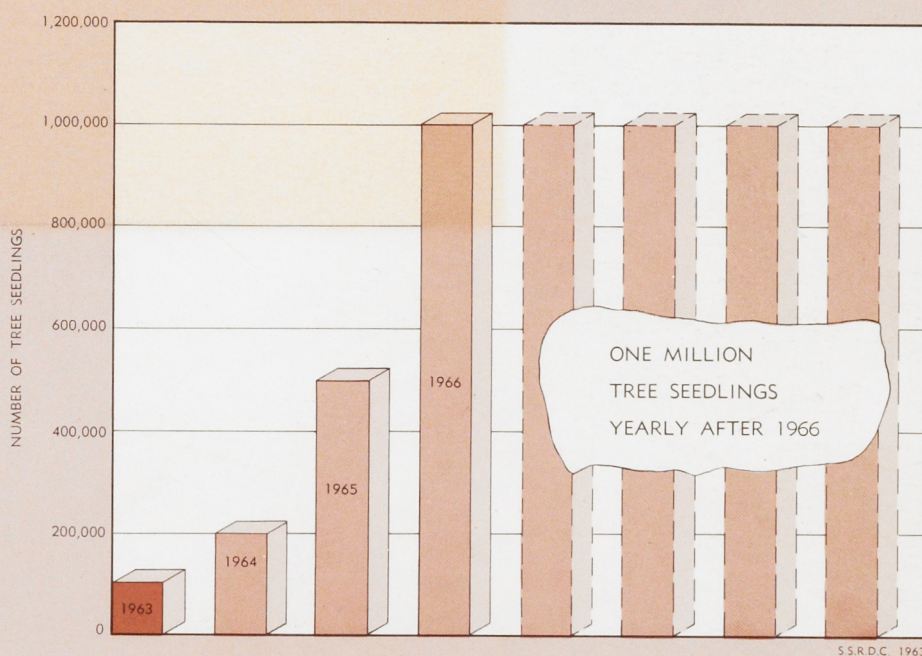
parks, boat launching sites, group camps and wildlife habitat. The report also pointed up a number of problems such as possible slumping and erosion hazards and a shortage of good tree growth for shade and shelter around the reservoir margins.

RECREATION PROGRAM

Based upon the recommendations of this report, the Department of Natural Resources has prepared a long-term program for the development of park facilities. By 1967, which is expected to be the first full recreation season, picnic sites, camping space, swimming and boating areas should be ready for public use.

Over a period of twenty-five or thirty years, major programs of park and shoreline improvement will be undertaken. The afforestation program, for example, is the most ambitious ever undertaken in the province. Shade and shelter will be created around the shoreline by planting up to a million trees per year. These will be mainly fast-growing, deciduous species, developed by federal and provincial nurseries in the province. In key areas, such as the heart of provincial parks and the core areas of other important recreation sites, irrigation will be employed to encourage fast growth and a high rate of tree survival.

AFFORESTATION PROGRAM—SOUTH SASKATCHEWAN PROJECT



PROGRESS OF DEVELOPMENT

By late 1962, the consultant's report on recreation potential had been evaluated in the field by staff of the Department of Natural Resources and enough was known of the nature of the reservoir shoreline to begin site selection. First priority was given to selection of provincial park sites and sites to replace recreation facilities affected by reservoir flooding.

Department of Natural Resources staff assisted several local groups to locate suitable new sites along the reservoir margins. A regional park group composed of the village of Riverhurst, surrounding municipalities and several other communities, selected a site a mile or two from Riverhurst. The new park, to be known as Palliser Regional Park, will replace the old facility near the Riverhurst ferry which served a much smaller population.

The village of Elbow located where the Qu'Appelle arm meets the main stem of the reservoir will also lose a fine, well-treed recreation area because of reservoir flooding. The village, lying within one-quarter mile of the reservoir shoreline, has been fortunate in finding a scenic site for relocation. A local church camp has also selected a site for relocation close to the village of Elbow and near the provincial park on the Qu'Appelle Arm.

Three large provincial parks will be located on the reservoir shoreline. The parks will be widely separated and will serve different areas of population.

General location of a future Palliser Regional Park; waters of the reservoir will rise about 130 feet above the river here.

Sask. Govt. Photo.



At the main dam a provincial park will cater to visitors to the dam and power plant and will be nearer to the city of Saskatoon than any other recreation site of comparable size. The development of this park will await the completion of construction and extensive landscape improvement will be needed before the area takes on a park-like appearance.

Toward the upper end of the reservoir another park will lie amidst bold scenery deep in the valley at Saskatchewan Landing. The park will be only thirty miles from the city of Swift Current whose residents now have to travel over one hundred miles to reach a provincial park. A major tree planting program will be needed to develop shade and shelter, but good beaches with gentle slopes suitable for swimming will be present.

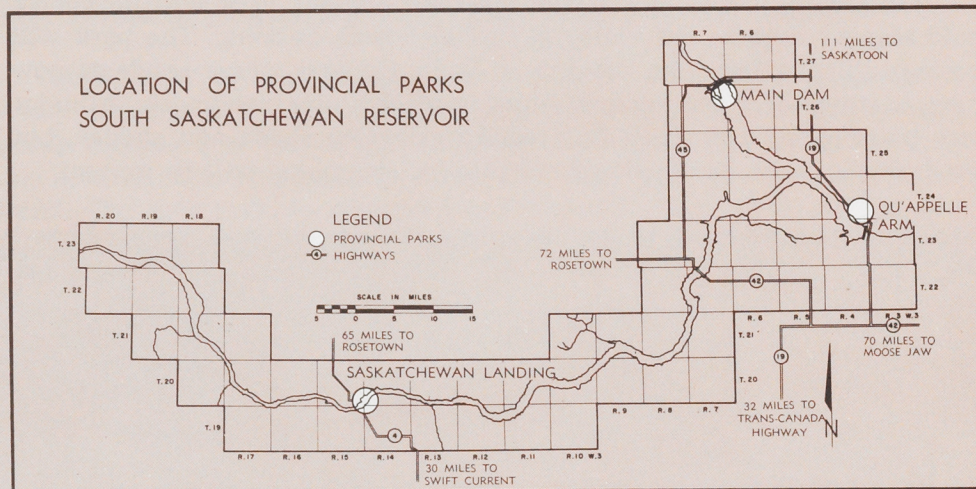


General view of provincial park area in vicinity of the South Saskatchewan Dam.

Sask. Govt. Photos.

Saskatchewan Landing, heart of a future provincial park.





Perhaps the best natural recreation area on the whole reservoir will serve as a provincial park nucleus on the north shore of the Qu'Appelle arm. Poplar bluffs offer immediate shade and shelter and excellent sand beaches and expected to form along a four-mile stretch of shoreline. The Qu'Appelle Dam will be an added attraction for park visitors.

Site planning in these provincial parks began during 1963. The first step involved a close analysis of the physical potential and problems of each area which will form the basis for a master development plan. The department also examined the physical potential of a number of locations suitable for cottage areas, institutional camps, boat launching and other sites during 1963.

A number of private and institutional groups are beginning to take an active interest in recreation sites on the reservoir. Two such groups, the provincial 4H organization and a church group, have selected future camp sites. When the reservoir waters begin to rise, a great deal of interest will likely develop in the recreation possibilities of the reservoir and as the first recreation season approaches, a clearer picture of the demand for sites may be expected to emerge.

Attractive scenery near Swift Current Creek, an area suitable for future recreational development.

Sask. Govt. Photo.



A Proposed Group Camp Site.

Sask. Govt. Photo.

THE PROJECT

The groundwork of the past five years has brought the realization of benefits much closer. Water for farmlands, generation of hydro-electric power, water for towns and cities, and a large new recreation area were a distant prospect a few years ago. Now they are rapidly moving within grasp.

From this point in project construction and in the development of benefits it may be well to pause and survey the future road to full development of the project as well as what has so far been achieved.

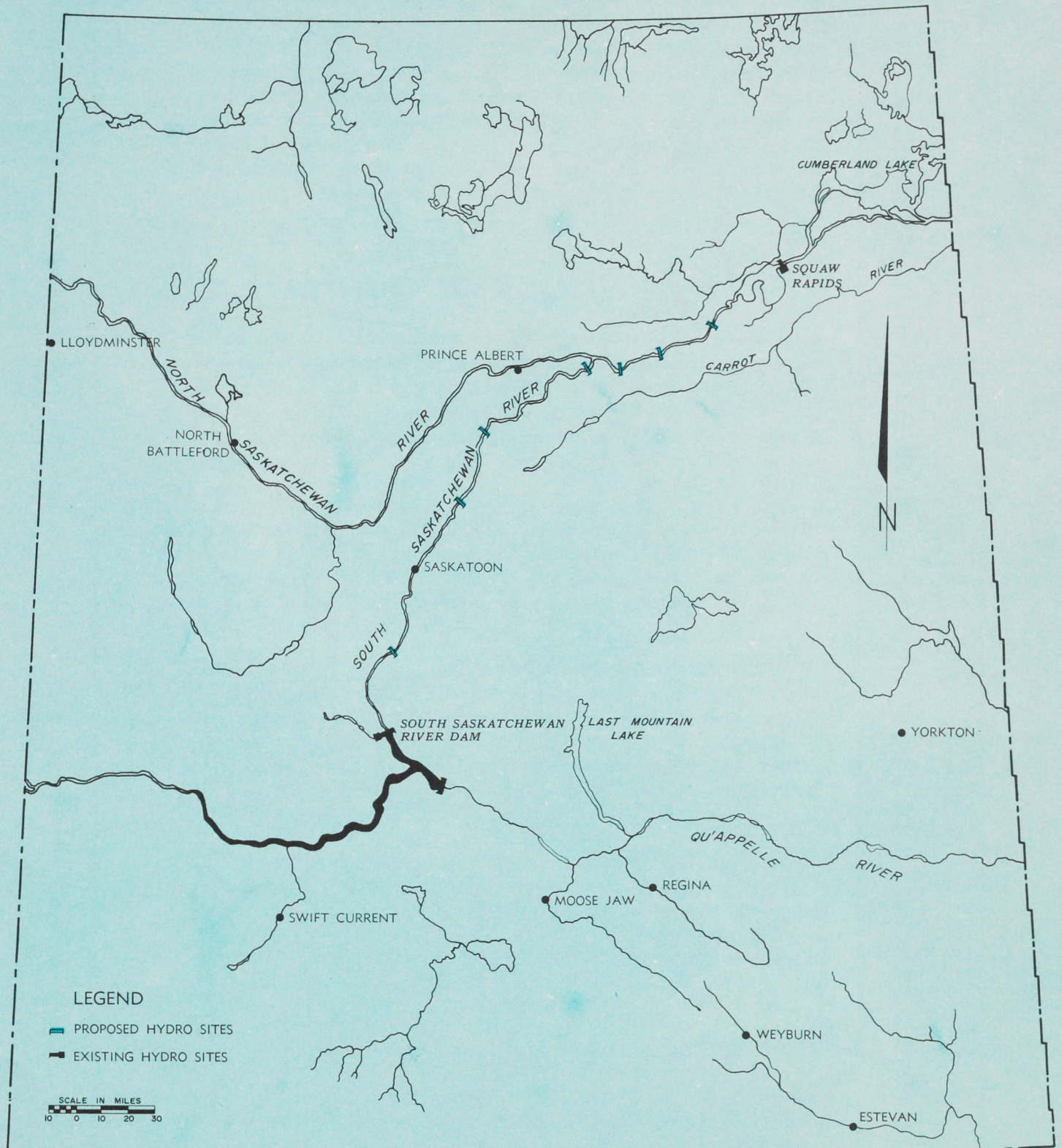
By the spring of 1966 at the latest, reservoir construction should be completed. The reservoir will likely be filled by the summer of 1967, though low run-off in the Saskatchewan system could delay this date.

It is expected that irrigation development will take place in stages thereafter. Initial development will probably take place near Outlook either on the east or west sides of the river. Some time later, the whole of the Conquest-Donavon area will be serviced, bringing the total irrigated land to about 110,000 acres. This may be followed by the remaining 90,000 acres in the Vanscoy, Asquith, Tessier and related units. While 200,000 acres appear irrigable at the present time, improvements in technology and economic prospects may increase this area even before the acreage presently estimated to be irrigable is fully developed.

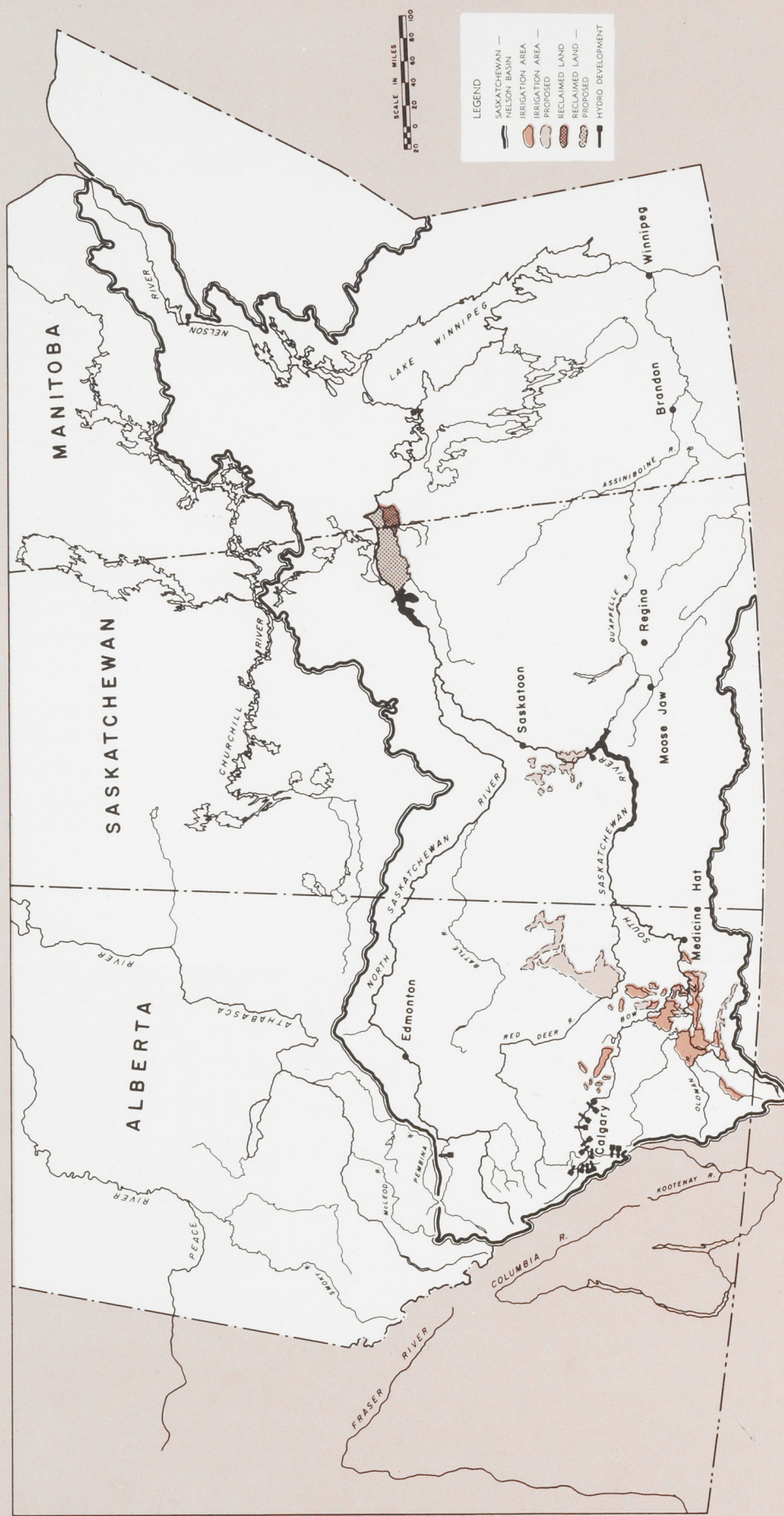
The recreation program may require public expenditures of some \$15 million. While the emphasis in the immediate future will be directed toward the provision of facilities for picnics, camping and boating, long-term plans include wildlife habitat areas, game preserves, hiking and riding trails. The bold scenery of the Saskatchewan Landing park will be particularly suited to the latter forms of outdoor enjoyment. The unstable shoreline of the mid-section of the reservoir is unsuitable for the more popular forms of recreation because of a threat of slumping and erosion, but may be used effectively for less intensive forms of recreation activity.

The project will be a valuable source of hydro-power. In addition to the power generated at the Coteau Creek site, other power benefits will occur downstream from the reservoir as a result of the regulation of river flows by means of controlled releases through the South Saskatchewan Dam. The large storage capacity of the reservoir will make the entire head, or drop, in the river below the dam more attractive for hydro generation. Power development would be achieved by building a series of dams on the south branch and the main stem of the Saskatchewan River, each forming a lake extending back to the foot of the next dam upstream. The diagram indicates existing and potential sites below the South Saskatchewan Dam.

POTENTIAL HYDRO SITES, SOUTH BRANCH AND MAIN STEM OF SASKATCHEWAN RIVER



WATER RESOURCE DEVELOPMENTS: SASKATCHEWAN-NELSON BASIN



The reservoir will offer an assured water supply for communities and industries in the southern part of the province. The availability of water, either directly from the reservoir, or via the Qu'Appelle diversion could be vitally important to the future development of the economy of this area. Already, resource-based industries such as potash are using water supplies diverted from the South Saskatchewan. The cities of Regina and Moose Jaw are also diverting South Saskatchewan water via Buffalo Pound Lake and can look forward to a reliable supply when the reservoir is completed. In the more distant future, water may be diverted via the Qu'Appelle and from there by pipeline or canal to communities in the southeastern part of the province, eventually perhaps entering the Souris basin.

FULL DEVELOPMENT POSSIBILITIES

One estimate of future demands for water from the South Saskatchewan Reservoir prepared by the Commission, indicates that requirements for purposes other than power will reach 700,000 acre-feet annually before 1980 and by 2000 will exceed 1 million acre-feet annually. Though the magnitude of the increase is open to question, most authorities agree that it will be considerable.

Similarly it is anticipated that the existing surface water supplies of the Saskatchewan system may be heavily taxed by demands within the province before the turn of the century. Taken in conjunction with requirements in the provinces of Alberta and Manitoba, it is clear that the available flows in the Saskatchewan system must be efficiently utilized to meet the needs of the three provinces.

The development of the Saskatchewan system — or rather the Saskatchewan-Nelson system as it must be designated if natural boundaries rather than political boundaries are employed — will likely move rapidly during the next forty years. A major step in this direction was taken in the latter part of 1963, when the three prairie provinces agreed to conduct a joint study of the water resources of the Saskatchewan-Nelson basin, including potential additional supply by diversion and storage.

If studies now under way suggest that demands for water will exceed supplies available in the Saskatchewan-Nelson system within the foreseeable future, ways of augmenting supplies will have to be considered. Reference to the following map indicates that a number of rivers flowing to the Arctic and the Pacific carry large flows, a part of which could perhaps be diverted into the Saskatchewan-Nelson system. These include the Churchill, Athabasca, Peace, Columbia and Fraser Rivers.

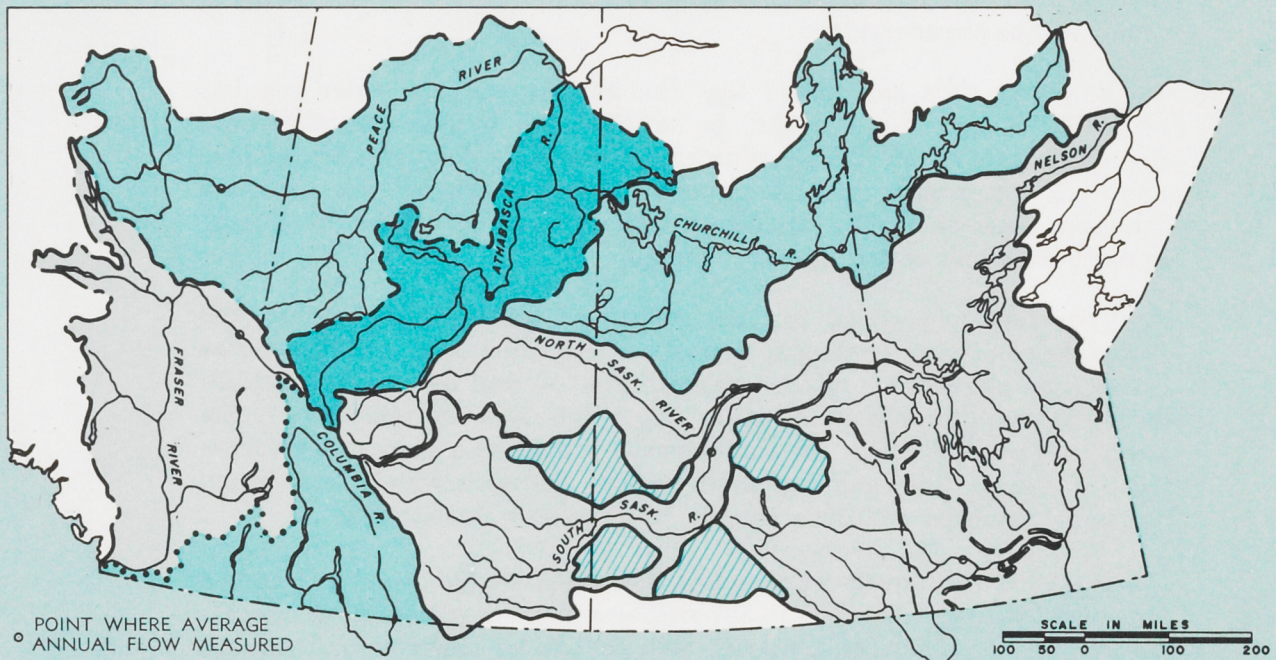
A number of proposals have been made concerning possible ways to divert part of the flows from each of the rivers; these are shown on the following map. Additional work will be required to indicate the most effective and at the same time the most economic scheme or schemes for augmenting water supplies in the Saskatchewan-Nelson system.

It is evident from these maps that if inter-basin diversions take place, the position of the South Saskatchewan Reservoir as a key river control structure will be enhanced. The South Saskatchewan Reservoir may thus become the hub of a major water supply system, where water is stored and from where it is redistributed to meet the needs of water-short areas in southern Saskatchewan and Manitoba.

Whatever the precise course of future development of the South Saskatchewan Project, there is little doubt that its importance will increase steadily with the years. By removing a major limiting factor — water supply — it will make a vital contribution to the agricultural, industrial and recreation development of a vast area of the southern prairies.

RIVER BASINS OF WESTERN CANADA

BRITISH COLUMBIA ALBERTA SASKATCHEWAN MANITOBA

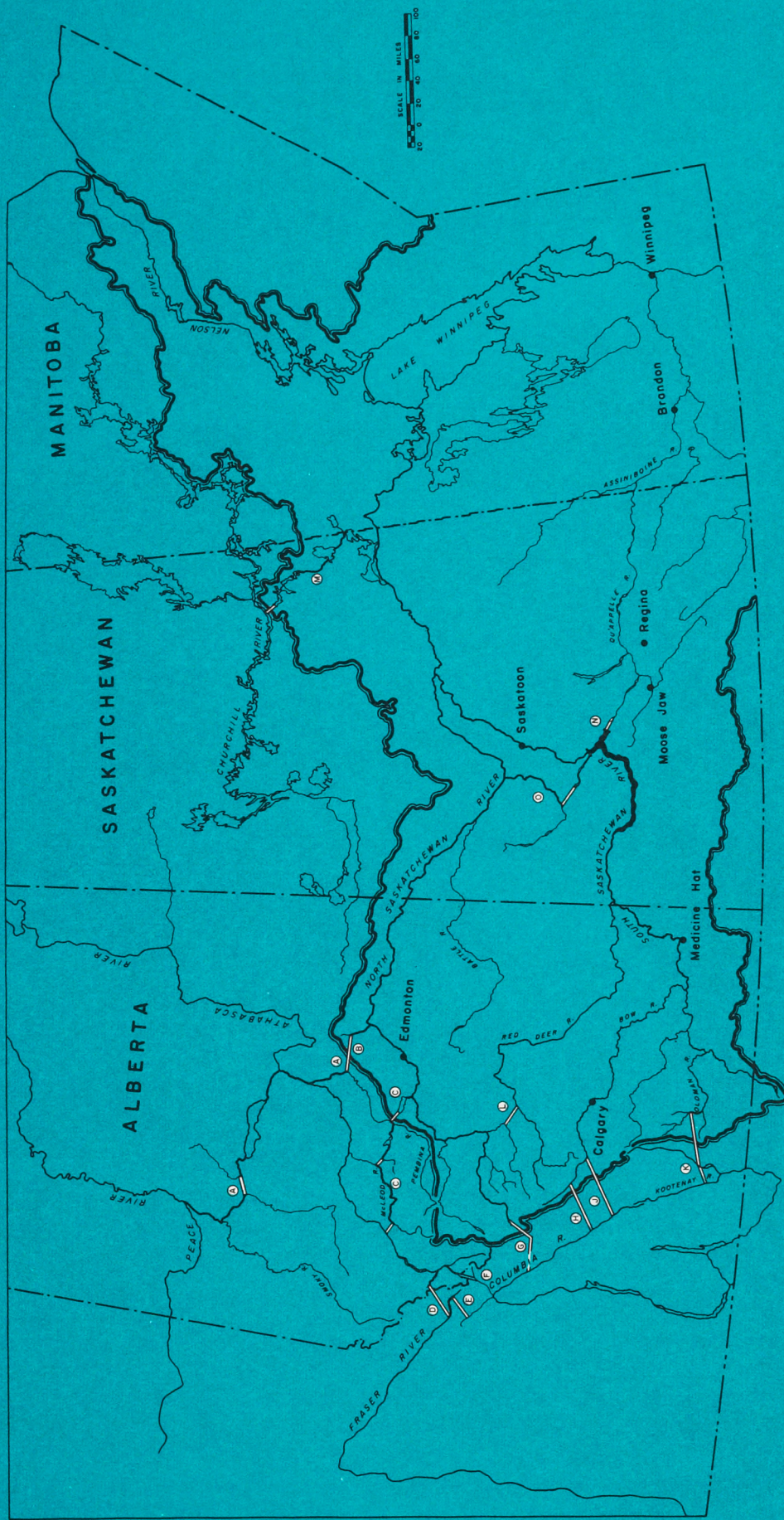


○ POINT WHERE AVERAGE ANNUAL FLOW MEASURED

	DRAINAGE BASIN	AREA (1000 SQ. MI.)	AV. ANN. FLOW (MILLIONS OF ACRE FEET)
	CHURCHILL	109.1	15.2
	ATHABASCA	62.9	10.9
	PEACE	125.2	26.8
	FRASER	84.1	4.6
	COLUMBIA (AT BORDER)	39.6	69.3

	DRAINAGE BASIN	AREA (1000 SQ. MI.)	AV. ANN. FLOW (MILLIONS OF ACRE FEET)
	NELSON	414.0	50.7
	NORTH SASKATCHEWAN	46.7	5.8
	SOUTH SASKATCHEWAN	61.1	7.2
	ASSINIBOINE	41.1	0.7
	INTERIOR DRAINAGE	35.8	

DIVERSION POSSIBILITIES, SASKATCHEWAN - NELSON AND ADJACENT BASINS



LEGEND

— DIVERSION CANAL OR TUNNEL

— DIVERSION COURSE

① PEACE TO N. SASK. VIA ATHABASCA

② ATHABASCA TO N. SASK. VIA REDWATER

③ ATHABASCA TO N. SASK. VIA McLEOD R., PEMBINA R., AND WABAMUN LAKE

④ FRASER TO ATHABASCA VIA YELLOWHEAD PASS

⑤ MICA RESERVOIR TO ATHABASCA VIA YELLOWHEAD PASS

⑥ COLUMBIA TO ATHABASCA NEAR JASPER

⑦ COLUMBIA AT SURPRISE RAPIDS TO N. SASK. AT GLACIER LAKE

⑧ COLUMBIA TO S. SASK. VIA BOW NORTH OF BANFF

⑨ COLUMBIA TO S. SASK. VIA BOW SOUTH OF BANFF

⑩ KOOTENAY TO S. SASK. VIA CROW'S NEST PASS AND OLDMAN RIVER

⑪ N. SASK. TO S. SASK. VIA CLEARWATER

⑫ CHURCHILL TO SASK. VIA PELICAN LAKE, STURGEON-WEIR R. AND AMISK LAKE

⑬ S. SASK. TO QU'APPÉLLE

⑭ N. SASK. TO S. SASK. VIA EAGLEHILL CREEK AND ANERLEY LAKES

APPENDIX I

PROVINCIAL EXPENDITURES ON THE SOUTH SASKATCHEWAN PROJECT

Shareable Items

Reservoir Construction ¹	1959-60	1960-61	1961-62	1962-63
1. Dept. of Agric.	\$ 62,492	\$ 563,387	\$ 1,267,172	\$ 1,944,205
2. Sask. Power Corp.	62,492	563,387	3,248,620	1,831,109
3. Dept. of Highways	—	20,456	12,005	(15,106)
4. S.S.R.D.C.	—	—	8,275	2,055

Non-Shareable Items²

Irrigation (Dept. of Agric.)				
Admin. and Engineering	188,827	371,061	194,849	114,211
Power (Sask. Power Corp.) ³				
Engineering	76,000	5,477	57,000	153,957
Capital	—	—	128,500	—
Recreation (Dept. of Nat. Res.)				
Admin. and Planning ⁴	16,497	4,889	1,304	7,666
Capital ⁵	14,340	9,100	107,164	99,038
Co-ordination (S.S.R.D.C.)				
Admin., Engineering and Planning	32,300	68,082	71,302	95,910
Other (Highway Relocation)				
Engineering (Dept. of Highways)	—	25,542	14,763	8,576
	<u>\$ 452,948</u>	<u>\$ 1,631,381</u>	<u>\$ 5,110,954</u>	<u>\$ 4,241,621</u>

¹ Includes Saskatchewan share of P.F.R.A. expenditures and Saskatchewan expenditures paid during the year less the refund of Canada's share of Saskatchewan expenditure received during the year. Figures in brackets indicate a net payment from Canada to Saskatchewan.

² Includes only direct expenditures for materials and services associated with the project and does not include some minor expenditures or pro-rata share of general government administration and overhead which would be difficult or impossible to segregate.

³ These expenditures are on calendar year basis.

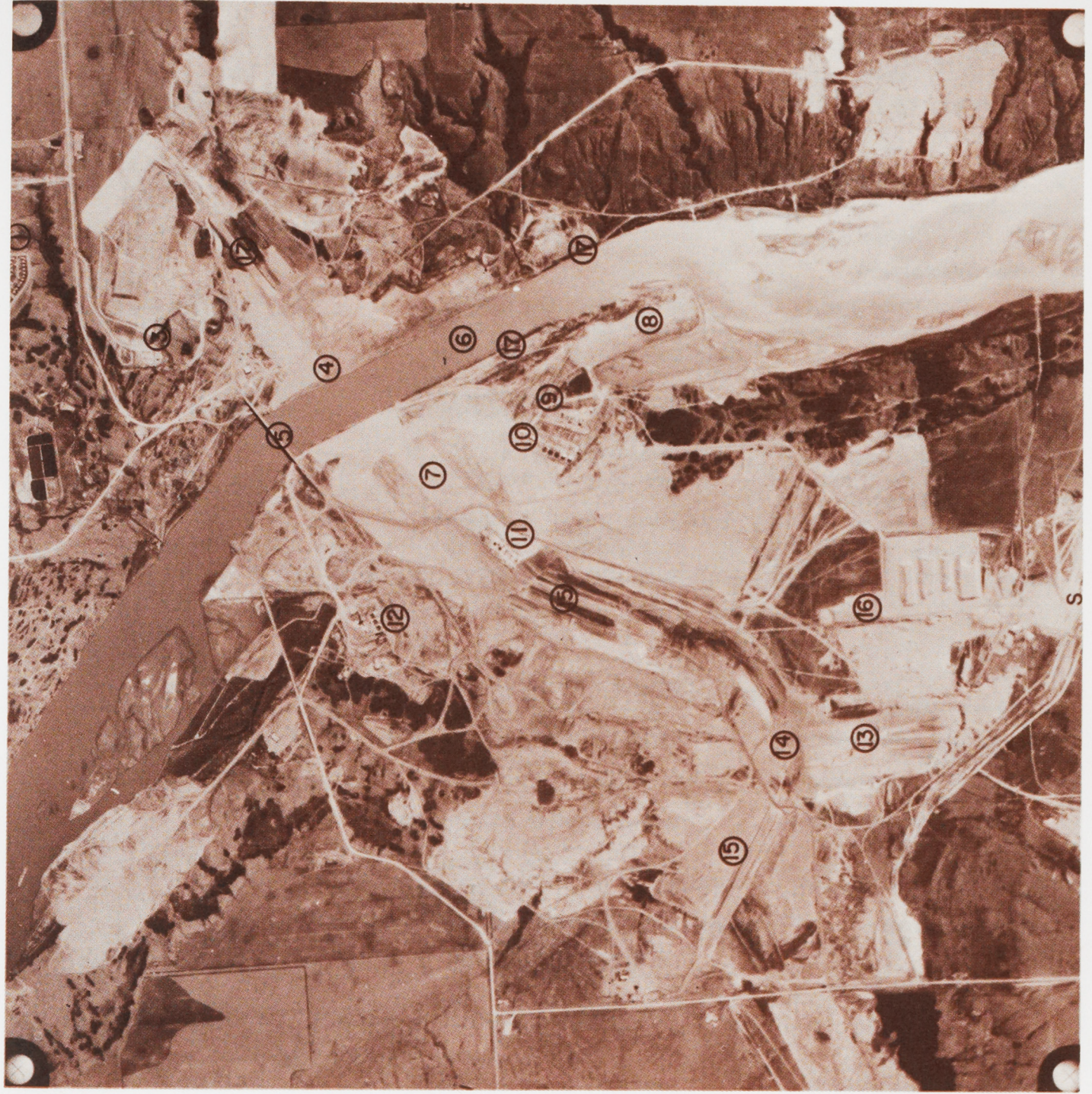
⁴ Includes small expenditures made by the South Saskatchewan River Development Commission in 1959-60 and 1960-61 for recreation survey.

⁵ Includes small capital expenditures made by Department of Industry and Information in 1959-60 for improvements to picnic site near main dam.

CONSTRUCTION AREA SOUTH SASKATCHEWAN DAM

Identification of Areas

1. P.F.R.A. Headquarters
2. Contractors' Camps (not visible)
3. Observation Point
4. Stage I Embankment
5. Construction Bridge
6. River Closure Section
7. Stage II Embankment
8. Upstream Waste Berm
9. Tunnel Inlets
10. High Level Intakes
11. Control Shafts
12. Tunnel Outlets
13. Spillway Approach Channel
14. Spillway Crest
15. Stage III Embankment
16. Concrete Aggregate Stockpiles
17. Stage IV Embankment



P.F.R.A. Photo.

APPENDIX II

CONTRACTS AWARDED ON SOUTH SASKATCHEWAN PROJECT TO DECEMBER 31, 1963

A. Contracts Awarded by P.F.R.A.: Shareable Canada 75% and Saskatchewan 25%

Contract	Contractor	Contract Price
I. Site Establishment		
# 1 East Access Road	Evans Const., Co., Saskatoon	\$ 164,330.63
# 3 Headquarters Services	Beattie Ramsay Co., Regina	242,236.56
# 4 Construction Headquarters Buildings	Smith Bros. & Wilson, Regina	736,494.39
# 5 Construction Bridge Substructure	Foundation Co. of Canada, Calgary	314,949.42
# 7 North Access Road	Taylor Bros., Regina	143,479.49
# 8 Construction Bridge Superstructure	Bird Const. Co., Regina	1,044,168.38
#10 Well-point System	Beattie Ramsay Co., Regina	23,392.00
#11 Pumps	Fairbanks Morse Co., Regina	12,026.00
#12 Tourist Pavilion	Bird Const. Co., Regina	20,771.00
SUB-TOTAL FOR SITE ESTABLISHMENT		<u>\$ 2,701,847.87</u>
II. Embankment		
# 6 East Embankment—Stage I	Perini Ltd., Toronto	\$ 2,990,919.61
# 9 West Embankment—Stage II	Piggott Const. Co., Saskatoon	8,395,957.50
#13 West Embankment—Stage III	Bedford Const. Co. Ltd., Rexdale, Ont.	8,297,950.00
#19 Relief Wells and Drainage Conduit—Stage I	Piggott Const. Co., Saskatoon	207,625.26
#31 Embankment—Stage IV	McNamara Western Ltd., Edmonton	<u>3,846,700.00</u>
SUB-TOTAL FOR EMBANKMENT		<u>\$23,739,152.37</u>
III. Tunnels		
# 2 Processing Aggregate	McNamara Const. Ltd., Edmonton	\$ 868,681.12
#14 Downstream Tunnels	Keiwi-Johnson-Poole Const. Cos., Vancouver	8,344,175.00
#15 Supply of Steel Ring Beams	Commercial Shearing & Stamping Co., Hamilton	2,637,250.00
#18 Supply of Cement	Canada Cement Co. Ltd., Montreal	117,008.48
#21 Upstream Tunnels	Keiwi-Johnson-Poole Const. Cos., Vancouver	8,658,500.00
#22 Processing Aggregate	McNamara Const. Ltd., Edmonton	1,693,750.00
#24 Supply of Cement	Canada Cement Ltd. & Inland Cement Ltd.	3,118,221.86
#25 Control Shaft Substructures	Keiwi-Johnson-Poole Const. Cos., Vancouver	5,005,520.00
#27 Tunnel Outlet Basin	Bedford Const. Ltd., Rexdale, Ont.	1,128,425.00
#28 Control Shaft Superstructures	Keiwi-Johnson-Poole Const. Cos., Vancouver	955,048.00

Contract	Contractor	Contract Price	Totals
#29 Tunnel Control Gates	Dominion Bridge Co. Ltd., Regina	1,146,560.00	
#30 Supply of Steel Ring Beams	Saskatchewan Steel Fabricators Ltd., Regina	537,721.25	
#32 Tunnel Control Gate Hoists	Dominion Bridge Co. Ltd., Regina	370,654.00	
#39 Cathodic Protection for Tunnels	Cathodic Protection Ltd.	90,535.02	
SUB-TOTAL FOR TUNNELS			<u>\$34,672,049.73</u>
IV. Spillway			
#34 Spillway Crest	Keiwit-Johnson-Poole Const. Cos., Vancouver	\$ 5,363,632.00	
#35 Supply of Cement	Canada Cement Ltd. & Inland Cement Ltd.	1,822,678.00	
#41 Supply of Fly Ash	Saskatchewan Power Corporation	204,315.00	
SUB-TOTAL FOR SPILLWAY			<u>\$ 7,390,625.00</u>
V. Qu'Appelle River Dam			
#36 Qu'Appelle River Dam	Emil Anderson, Square M & Coleman Collieries (Joint Venture)	\$ 9,593,230.00	
SUB-TOTAL FOR QU'APPELLE RIVER DAM			<u>\$ 9,593,230.00</u>
VI. Highway Relocation			
#16 Revision of Highway #45	Pederson & Co., Swift Current	\$ 118,664.91	
#17 Revision of Highway #19	Acorn Const. Co., Rivers	249,178.57	
#20 Graveling of Highway #45 Revision	W. F. Bodkin Const. Ltd., Regina	14,208.84	
#23 Graveling of Highway #19 Revision	Nick Linden Const., Medicine Hat	35,405.35	
#26 Revision of Highway #45	Sanderson & Elgert, Regina	140,003.00	
#33 Graveling of Highway #45 Revision	South Const. Co. Ltd., Regina	15,370.00	
SUB-TOTAL FOR HIGHWAY RELOCATION			<u>\$ 572,830.67</u>
TOTAL VALUE OF CONTRACTS AWARDED BY P.F.R.A. TO DECEMBER 31, 1963			<u>\$78,669,735.64</u>

B. Contracts Awarded by Saskatchewan Power Corporation

(i) Shareable Canada 25% and Saskatchewan 75%

Contract	Contractor	Contract Price	Total
Supply of Steel Plate for Tunnels	Interprovincial Steel Corp., Regina	\$ 988,200.00	
Fabrication and Delivery of Tunnel Liner	Sparling Tank and Manufacturing Co., Toronto	1,119,062.72	
TOTAL VALUE TO DECEMBER 31, 1963			<u>\$ 2,107,262.72</u>

(ii) Two non-shareable contracts were awarded by the Saskatchewan Power Corporation during 1963.

- (a) Supply, delivery and installation of 3—62,200, K.V.A. Waterwheel Generators to the Canadian Westinghouse Company Ltd.
- (b) Supply, delivery and installation of 3—84,000 H.P. Hydraulic Turbines to English Electric (A Division of John Inglis Company).

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